THESIS

FOR THE AWARD OF DEGREE OF

MASTER OF SURGERY (General Surgery)

SESSION 2020-2023

"COMPARISON OF THE OUTCOME OF DIATHERMY v/s SCALPEL SKIN INCISION IN SURGICAL CASES"

DR. NIDA KHAN

SANTOSH DEEMED TO BE UNIVERSITY
NO. 1, SANTOSH NAGAR,
GHAZIABAD-201009, NCR DELHI, INDIA

DEPARTMENT OF GENERAL SURGERY
SANTOSH MEDICAL COLLEGE & HOSPITAL
GHAZIABAD, NCR DELHI

THESIS

FOR THE AWARD OF DEGREE OF

MASTER OF SURGERY (General Surgery)

SESSION 2020-2023

"COMPARISON OF THE OUTCOME OF DIATHERMY v/s SCALPEL SKIN INCISION IN SURGICAL CASES"

DR. NIDA KHAN

SANTOSH DEEMED TO BE UNIVERSITY
NO. 1, SANTOSH NAGAR,
GHAZIABAD-201009, NCR DELHI, INDIA

DEPARTMENT OF GENERAL SURGERY
SANTOSH MEDICAL COLLEGE & HOSPITAL

GHAZIABAD, NCR DELHI

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

COPY RIGHT CERTIFICATE-DECLARATION BY THE CANDIDATE

I hereby declare that Santosh Deemed to be University, Ghaziabad, (U.P.) shall have the right to preserve, use and disseminate this thesis titled **"comparison of the outcome of diathermy v/s scalpel skin incision in surgical cases"** in print or electronic format, for academic or research purpose.

Signature of Candidate:

Date:

Place:

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

SANTOSH UNIVERSITY

DECLARATION BY THE CANDIDATE

I hereby declare that this thesis titled "**Comparison of the outcome of diathermy v/s scalpel skin incision in surgical cases**" is a bonafide genuine research work carried out by me under the esteemed guidance of my Guide **Prof. (Dr.) Shalabh Gupta** Professor & Department of General Surgery, Santosh Medical College & Hospital, Ghaziabad, U.P.

Signature:

Date:

Place:

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

CERTIFICATE BY THE GUIDE

This is to certify that the thesis titled **"comparison of the outcome of diathermy v/s scalpel skin incision in surgical cases"** is a bonafide genuine research work carried out by **Dr. Nida Khan** in partial fulfillment of the requirement for the degree of **M.S. General Surgery** under my Supervision and guidance in department of surgery, Santosh Medical College & Hospital, Ghaziabad, U.P.

GUIDE: **Prof. (Dr.) Shalabh Gupta**

M.B.B.S., M.S. General Surgery

Professor

Department of General surgery

Santosh Medical College & Hospital, Ghaziabad- 201001

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

CERTIFICATE BY THE CO-GUIDE

This is to certify that the thesis titled **"comparison of the outcome of diathermy v/s scalpel skin incision in surgical cases"** will be a bonafide genuine research work carried out by **Dr. Nida Khan** in partial fulfillment of the requirement for the degree of **M.S. General Surgery** under my Supervision and guidance in department of surgery, Santosh Medical College & Hospital, Ghaziabad, U.P.

CO- GUIDE: **Prof. (Dr.) Tripta S Bhagat**

M.B.B.S., M.S. General Surgery

Professor

Department of General Surgery

Santosh Medical College & Hospital, Ghaziabad- 201001

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

CERTIFICATE BY THE HEAD OF DEPARTMENT

This is to certify that the protocol titled **"comparison of the outcome of diathermy v/s scalpel skin incision in surgical cases"** being submitted by **Dr. Nida Khan** in partial fulfillment of the requirement for the degree of **M.S. General Surgery** will be based on the bonafide work carried out by him in Department of surgery, Santosh Medical College & Hospital, Ghaziabad, U.P.

Prof. (Dr.) Sameer Naqash

M.B.B.S., M.S. General Surgery

Professor & Head

Department of General Surgery

Santosh Medical College & Hospital, Ghaziabad- 201001 (UP)

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

ENDORSEMENT BY THE DEAN OF THE COLLEGE

This is to certify that the protocol titled **"comparison of the outcome of diathermy v/s scalpel skin incision in surgical cases"** will be a bonafide genuine research work carried out by **Dr. Nida Khan** himself under the esteemed guidance of **Prof. (Dr.) Shalabh Gupta**, Professor & HOD, General Surgery, Santosh Medical College & Hospital Ghaziabad.

Prof. (Dr.) Alka Agarwal

Dean

Faculty of Medical Sciences

Santosh Medical College & Hospital,

Santosh Deemed to be University.

Ghaziabad-201001 (UP)

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

ANTI-PLAGIARISM DECLARATION/UNDERTAKING

I, **Dr. Nida Khan**, hereby declare that the present thesis titled **"comparison of the outcome of diathermy v/s scalpel skin incision in surgical cases"** under the guidance of **Prof. (Dr.) Shalabh Gupta** at Santosh Deemed to be University is a bonafide/original research work. I also hereby declare that there is less than 10% similarity and the present research work has not been submitted for the award of any degree/diploma of the same institution where the work was carried out or at any other institution.

Signature of the Guide **Signature of the Student**

I have verified the contents of the thesis and it has less than 10% similarity.

Dr. Jyoti Batra

Dean Research

Santosh Medical College & Hospital

Santosh Deemed to be University

Ghaziabad – 201001(U.P.)

ACKNOWLEDGEMENT

Ambition, is the translation of a moment in time where something, deeply inspires you & ignites, within the fire to achieve it all. For me, that moment in internship where I saw, a scrubbed-up surgeon separating an ailment from the patient, awe struck me, it was in that moment I knew that. M.S. General Surgery is my calling. Being a surgery resident has taught me not just about the clinicians' practice but also a great deal about observation, endurance & emotional stability. Residency has taught me to smile through the tears & to push myself as a human & a doctor for the greater good of patient welfare & health.

With heartfelt modesty, it is a genuine pleasure to express my deep sense of thanks and gratitude to my mentor, teacher, and Guide ***Dr. Shalabh Gupta****, Dean academics & Professor, Department of General Surgery. It has been my delightful pleasure to walk under the shadow of such an eminent advisor and mentor for my study. I am grateful for his unvarying support, timely counsel, meticulous inspection, scientific approach and scholarly advice and guidance throughout my post-graduation which has helped me accomplish this research. He has always been approachable, understanding, calm and reasonable to our problems.*

I would also thank from bottom of my heart to ***Dr. Tripta S. Bhagat****, Vice chancellor & Professor of General Surgery for becoming my Co-guide and supporting me every time. Her presence and guidance made this research a wonderful journey.*

I would like to thank my HOD, ***Dr. Sameer H. Naqash*** *for imparting valuable scientific knowledge but at the same time being available as a mentor and as a support system, for that sir, I am forever in debt. Thank you for encouraging us all to become better people & surgeons.*

I would also like to extend my thanks and appreciation for all my Consultants ***Dr. Gyanendra S. Mittal, Dr. Aprajeeta, Dr. Sandeep Moolchandani, Dr. Siddharth Mittal, Dr. Rachit Goel, Dr. Rajiv Verma, Dr. Shishir Kumar, Dr. Rahul Gautam, Dr. Naveen Solanki, Dr. Anu Vibhu, Dr. Kartik Kaistha, Dr. Prakhar Garg and Dr. Sheikh Kasif Sahajada*** *for their support and valuable comment. They also have been role models in many ways commendable with learning in every step of our journey in this institution thus leaving a lasting impression on our mind & souls.*

I would like to thank all my Seniors ***Dr. Abhishek, Dr. Anshul, Dr. Alok, Dr. Jebin, Dr. Sagar, Dr. Angelin, Dr. Iftikhar and Dr. Priyanka Jadaun****; this thesis could not have been completed without their help and support.*

My heartfelt thanks to my Colleagues, ***Dr. Janani, Dr. Sayandeep, Dr. Nithin, Dr. Ruksana, Dr. Riya, Dr. Abhinav, and Dr. Madan****, who over these years have become like an extended family in a place far from home. With their help and support this journey has become memorable and easy sail thorough the tidy waves. I would like to thank all my juniors* ***Dr. Aadhar, Dr. Mansi, Dr. Deep, Dr. Sudhakar, Dr. Shilpa, Dr. Soha, Dr. Shreyansh, Dr. Rohan, Dr. Shrishti and Dr. Austin*** *this thesis could not have been completed without their help and support.*

I shall always cherish my association with Department of General Surgery, Santosh Medical College & Hospital, Ghaziabad where I had this opportunity of carrying out the present study and where I have learned and benefited immensely to become a good Surgeon.

To, my grandmother, late. Mrs. Mariyam Mohammed Shafi I owe, every minute of my life & it's success however big or small, her duas & guidance has changed my life and made me the woman that I am today, I wish she was physically present with me to see me achieve this milestone but I know her prayers are always with me through the heavens.

To, my mother Mrs. Yasmin Mohammed Shafi Chapewala, I owe my whole education, without her support emotionally & financially I would never be the woman that I am today, I am very blessed to have her constantly watch my back & never let me falter or go astray. My brother, Mr. Mohammed Khan is a fine gentleman who has been doing more that he can to support me as a younger sibling in all my emotional and mental needs, thank you.

To, Dr. Tanuj Khanna & Dr. Priyanka Jaiswal. My life in Santosh Hospitals & Ghaziabad would never be same without your help & support, thank you for always understanding me & being there for me as colleagues, friends & family.

To, my surgery faculty from the UG days, that have inspired me to be the woman & surgeon that I am, Dr. Aashay Shah, Dr. Raj Gautam & Dr. Anurag Tiwari, thank you being my mentors & friends.

Special mention & a big heartfelt thanks to my friends like family, without whom I would not be propelled in life, Dr. Swati Jha my younger sister & surgery aspirant, Mr. Sunil Jha & the profoundly maternal, Mrs. Bindu Jha. Dr. Aditya Sabu my younger sibling & upcoming surgeon and last but not the least, Mr. Akul Sabharwal my beau, for his time, patience & never dying support.

Lastly, I would like to thank Allah & the prophet (PBUH), for always spiritually guiding me and protecting me, Sheikh Abdul Qadir Jilani & the universe for always protecting me & teaching me the right lessons, when I needed them the most

THANKFUL & GRATEFUL.

Dr. Nida Nadim Khan

(Batch: 2020-2023)

INDEX

SERIAL NUMBER	CONTENT	PAGE NUMBER
1	INTRODUCTION	1-6
2	AIMS & OBJECTIVES	7-8
3	REVIEW OF LITERATURE	9-22
4	MATERIAL & METHODS	23-26
5	RESULTS & OBSERVATIONS	27-47
6	DISCUSSION	48-56
7	SUMMARY & CONCLUSION	57-59
8	BIBLIOGRAPHY	60-67
9	PROFORMA	68
10	CONSENT	69-70
11	CERTIFICATES	71-73
12	MASTERCHART	74

INTRODUCTION

INTRODUCTION

An incision is a cut or split that allows access to the underlying tissues. There are very few surgeries that can be done without cutting the skin. An incision may be used to get access to deeper tissues, or surgery on the skin itself, whether for damage healing or removal of a skin lesion. Surgeons have been looking for suitable skin incision procedures that will offer rapid and appropriate exposure with little blood loss. Cauterization is a medical word that refers to the process of burning a portion of the body in order to eliminate or shut it. Although electrocautery is increasingly employed for tissue dissection, concerns about severe scarring and poor wound healing have kept it from being widely used for skin incisions. [1]

Incisions are traditionally done using a stainless-steel scalpel. These incisions are designed to be bloodier and more painful. Many modern treatments, such as laser, plasma scalpel, and cavitron surgical aspirator, have been developed to address this issue; nevertheless, these technologies are expensive and generally inaccessible in the periphery.

Electrosurgery is the transmission of a high frequency electric current into tissues to create the desired therapeutic result. Diathermy is derived from the Greek words "therma" (heat) and "dia" (through). The literal definition of diathermy is "heating through." Diathermy was first used by a German physician, Carl France Nagelschmidt, in 1909.

Skin incisions for laparotomy operations have traditionally been done using scalpels and disposable knives, which are linked with increased blood loss and discomfort. This procedure has recently been replaced with electrosurgical skin incisions. [2]

To avoid the disadvantages of surgical steel scalpels, surgical diathermy was established at the beginning of the twentieth century. Surgical diathermy is often referred to as "electrosurgery" or "electrocautery."

Diathermy was regarded as an effective method of dissection due to its ease and haemostatic nature. Because it includes the use of high frequency alternating electric current, it is not regarded a true cutting incision. Diathermy is mostly utilised for three things: coagulation, fulguration, and cutting. [3]

Electrosurgery has the potential benefits of less blood loss, dry and quick tissue separation, and a probable lowered risk of inadvertent harm caused by the knife to working staff. [4,5]

The use of monopolar and bipolar energy delivery devices is possible with electrosurgical technology. In monopolar mode, the patient is positioned on top of the return electrode, which is either a sizable flexible metalized plastic pad or a sizable metal plate affixed to the electrode opposite the alternating current (AC) source.

A single-pointed probe is used by the surgeon to make contact with the tissue. From the probe tip through the body and back to the electrode, the electrical current is then sent back to the electrosurgical generator. This is because the current rapidly disperses laterally when it enters the body, significantly decreasing the current density.

In that they include both an active and a return electrode, bipolar instruments are comparable to surgical forceps, with one tine linked to one pole of the AC voltage source and the other tine connected to the other pole of the voltage source, a special forceps is used to deliver electricity to the patient. Instead of traveling through the body, the electrosurgical energy is contained to the tissue sandwiched between the forceps. A high-

frequency electrical current travels through the tissue in between the forceps tines while it is being grabbed by the forceps.[1]

Electrocautery burns are often caused by a defective grounding pad or a fire breakout. Because radiofrequency energy is contained inside the surgical instrument's limited surface area, monopolar electrocautery works. The patient acts as a conductor, allowing electricity to go through their body to a pad that is permanently connected to the RF generator.

There is no tissue damage at the pad position since the pad's surface area is larger than the instrument's tip. However, if the circuit is broken or the energy is concentrated in any manner, shocks and burns are possible outcomes. There have been incidents of flash flames caused by the use of electrocautery in operating rooms. Several instances have been reported. The occurrence of flash fires rises when the anaesthetic drug raises the oxygen tension. In the presence of combustible substances, the ESU should be avoided. Oxygen-rich surroundings should be avoided.[1]

Scalpels are often used to make surgical incisions. The use of a scalpel causes skin bleeding, which obscures the operating time. Diathermy is another approach for producing skin incisions. Diathermy is mostly utilised for tissue damage, particularly haemostasis. Diathermy is often avoided by surgeons when making skin incisions for a variety of reasons, including wound infection, delayed wound healing, and severe scarring.[2]

Diathermy involves passing a potential gradient dependent current through tissue at a high frequency (more than 100000Hz) to remove tissue, resulting in precise tissue lyses. It may be used to coagulate (modulated mode) or cut the tissue (sinusoidal pattern). This concept allows the use of diathermy electrodes without causing harm to neighbouring tissue. This method rapidly heats cells inside tissues to the point of

vaporization, creating a void within the cell matrix; the resulting heat is lost as steam rather than transferred to surrounding tissues. Further incision is made when additional cells are contacted and vaporized by the electrode. This explains how there was no scarring and how there was just minor scarring during the healing process.[6,7]

Despite its many benefits, most surgeons are skeptical about using diathermy instead of a traditional scalpel to create skin incisions during surgery. This is because of concerns about unneeded scarring, an increased wound infection rate, and slowed wound healing.[8,9]

When compared to a knife incision, a diathermy incision has many advantages. These include a shorter incision time, less blood loss, and less recovery time. An incision made using diathermy is not the same as one made with a knife

When tissue is heated by diathermy, the cells within the tissue evaporate and leave the space inside the cell matrix, and the resulting heat is dissipated as steam rather than being transferred to nearby tissue. An incision is made as the new cells are compressed and vaporized by the moving electrode.

More and more people are opting for diathermy as a treatment option since it is less invasive than other methods, causes less bleeding, and reduces the risk of infection at the wound's surface.8

Electro surgery, as opposed to the scalpel or CO2 laser for opening tissues after a scalpel incision, was shown to be effective in a study by Pearlman and colleagues. 10 When compared to patients whose laparotomies were performed with a scalpel, Kearns and co-workers found that those whose laparotomies were performed using monopolar electrosurgical pencil electrodes (Bovies) had reduced wound infection rates and lower pain ratings on days 1 and 2.[1]

In another worldwide trial, both groups' postoperative pain and complication rates were similar. As previously noted, the research on this subject is contentious; some studies favoured harmonic scalpel incisions, while others found no difference in postoperative discomfort between harmonic and conventional techniques.[11] Furthermore, there is a knowledge gap regarding scalpel vs diathermy in underdeveloped nations where cost is a major factor in selecting the surgical method employed.

AIMS & OBJECTIVES

AIM & OBJECTIVES

Recent improvements and research have shown that electrocautery may be utilised for skin incisions without causing post-operative issues such as wound infection, scarring, or discomfort. When compared to coagulation diathermy, which produces heat more slowly through an intermittent current output, cutting diathermy incises skin with less charring and necros.

AIM:

To study the comparison of outcome of diathermy versus scalpel skin incision in surgical cases.

OBJECTIVE:

To compare the outcome of scalpel versus diathermy on the basis of

1) Incision Time
2) Ease of operating
3) Post-operative
4) Hospital Stay
5) Cosmesis

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The Skin

The bulk of the areas of the body that are not regularly exposed to increased abrasion and wear and tear are covered with skin that is relatively thin. When compared to thick skin, the epidermis in these locations is thinner and has a more straightforward cellular composition. 12

Hair follicles, sebaceous glands, and a variety of sweat glands may be found even in skin that is quite thin (apocrine ne and eccrine). Both the connective tissue sheaths surrounding hair follicles and the dermal connective tissue sheath are related to smooth muscle fibers that go by the name of arrector pili. There are several sebaceous glands that are connected to hair follicles in the scalp. As a direct consequence of this, the words "thick skin" and "thin skin" refer only to the amount of epidermis that is present under the surface of the skin. It does not take into account the layers that lie underneath it, the thickness of which varies according on the area of the body.

The two layers that make up the skin are known as the epidermis and the dermis. The epidermis is the outermost layer of cells on the skin. Connective tissue fibers and epidermal cellular components are both found in the dermis, which is the layer of skin that sits directly underneath the epidermis.[13]

A stratified squamous epithelium and a thin layer of keratinized cells in the epidermis are responsible for the formation of the stratum corneum. The superficial cells of the stratum corneum desquamate or shed off the surface of the skin on a consistent basis. When compared to thick skin, thin skin possesses a stratum corneum that is noticeably more translucent. In the epidermis, a few rows of polygonal cells are responsible for the formation of the stratum spinosum layer.

Under the epidermis is where you'll find the papillary layer of the dermis, which is a very thin layer of connective tissue. Because of the indentation that this layer makes at the base of the epidermis, dermal papillae are produced. The bulk of the dermis is composed of the more superficial reticular layer. It is constructed of

dense connective tissue that is not evenly distributed. A thin layer of subcutaneous adipose tissue is found beneath the skin and is known as the hypodermis. Appendages of the skin, such as sweat glands and hair follicles, develop from the epidermis but are located in the dermis. One of the components of the sweat gland is coiled, and it may be found in the reticular layer of the dermis. The expanded component of the sweat gland is what is known as the excretory ductal sweat gland, and it reaches to the surface of the skin. The circular and deeper portions of the sweat glands both produce secretions. The expanded and terminal section of the hair follicle that is known as the hair bulb. Inside of each dermal papilla there is a network of capillaries that is very necessary for the upkeep of the hair follicles.

In addition to its function in nutrient delivery, the dermal vasculature, which may contain arteriovenous anastomoses or shunts, plays a part in the body's temperature regulation. When it is warm outside, the shunts reduce the amount of blood that flows through the papillary layer. This assists in keeping the internal temperature stable.

Because of its huge surface area and its position on the body's surface, the skin acts as a significant receiver for a variety of external stimuli. Numerous sensory receptors may be found in the skin. These sensory receptors range from simple nerve terminals that lack glial or collagenous coatings to more complex structures that include sensory fibers that are surrounded by glia and connective tissue. Those receptors that do not have a protective encapsulation.

• Tactile discs, also known as light touch sensors, which are coupled with epidermal tactile cells and function in the same way.[14]

• Free nerve endings in the papillary dermis that extend into the lower epidermal layer and respond mostly to temperature, pain, and itching, but also function as touch sensors. These nerve endings extend into the lower epidermal layer of the skin.

• Root hair plexuses, which are a network of sensory fibers located in the reticular dermis and surround the bases of hair follicles. These plexuses are responsible for sensing the movement of hair.

HISTORICAL ASPECTS

Separately, about the same time (1890-91), a French physician named Jacques-Arsène d'Arsonval and a Serbian theorized that high-frequency electromagnetic currents would have potential therapeutic use. In 1890, the American engineer Nikola Teslad' Arsonval carried out the first comprehensive research project on the physiological effects of alternating current on human subjects. According to what they found; frequencies higher than 10 kHz seldom ever induce any physiological reaction to an electric shock. He developed the three most common approaches that are used to provide high-frequency electricity to the body. There are three different varieties, and they are contact electrodes, capacitive plates, and inductive coils. In 1981, Nikola Tesla was the first person to discover that high-frequency currents had the ability to create heat in the body.

In the year 1900, the application of high-frequency electricity to the body was used to cure a wide variety of medical conditions. This practice emerged about the same time as the burgeoning medical field of electrotherapy. In the year 1899, the Austrian chemist von Zaynek began researching the rate of heat production in tissue as a function of frequency.

He was the first person to recommend using high-frequency currents as a therapy for deep heating. Karl Franz Nagelschmidt, a German physician, is credited with inventing diathermy around the year 1908. In 1913, he produced the very first diathermy instruction manual. Many people consider Nagelschmidt to be the founder of the discipline. [15-17]

During the years 1914 to 1927, while Dr. William T. Bovie was employed at Harvard University, he was the first person to create the electrosurgical equipment for commercial use. During a procedure that took place on October 1, 1926, Dr. Harvey Williams Cushing was the first person to make use of an electrosurgical generator.[18]

ELECTROCAUTERY

The heating coil of an electric toaster serves as a useful analogy for describing how electrosurgery really works. The application of a voltage results in the passage of current, which causes the material to experience an increase in temperature (like the tissue in the electrosurgery). A voltage source is delivered to the tissue while an electrosurgical procedure is being carried out. Because of this, an electrical current will begin to flow.

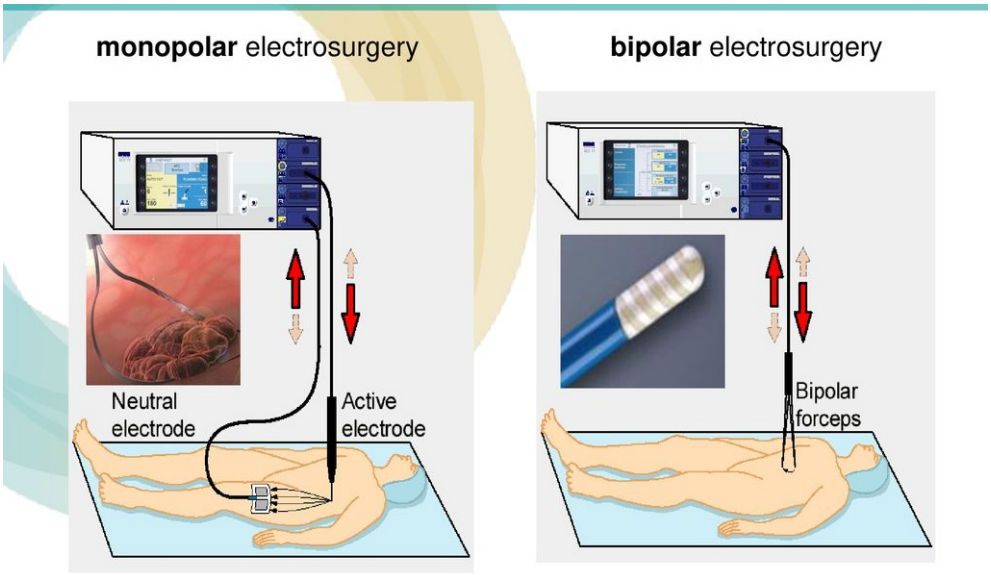
Between the tissue and the voltage source is created a basic electrical circuit, with the tissue serving the function of a resistor within the circuit. The resistance of the tissue is what determines the passage of the electric current. The connection described above is known as Ohm's law. The generation of heat in a resistor is caused by the flow of current through it. The damage done to the tissue is a direct result of the production of heat. To put it more simply, the resistance of the tissue is the cause, since it is this resistance that causes the electrical energy to be turned into heat (thermal energy), which eventually causes the temperature of the tissue to increase.[19]

Heat produced = Electrical energy expended

The electrical power (energy per time) expended and can be calculated using

Electrical Energy = Power X Time

- P stands for the wattage, which is the unit used to measure the amount of electrical power. This result provides us with the rate of heat generation (heat produced per unit time). Then why is it that the electrode is not being heated up, and what may be the cause of this? The reason for this is because the resistance of the metal is considerably lower than the resistance of the tissue, therefore only a very little amount of electrical power is lost while traveling through metal conductors. This is the same theory that explains why the toaster gets really heated up, while the power line does not become warm at all.



When performing electrosurgery, a specific piece of electronic equipment called "The voltage source" is used. This piece of equipment is more often known as an electrosurgical generator. Observed Increase in Temperature The temperature of a thing will vary as a result of the heating of the object. This shift in temperature is inversely proportional to its heat capacity, and the amount of heat required to bring an object's temperature up or down is directly related to the object's mass.

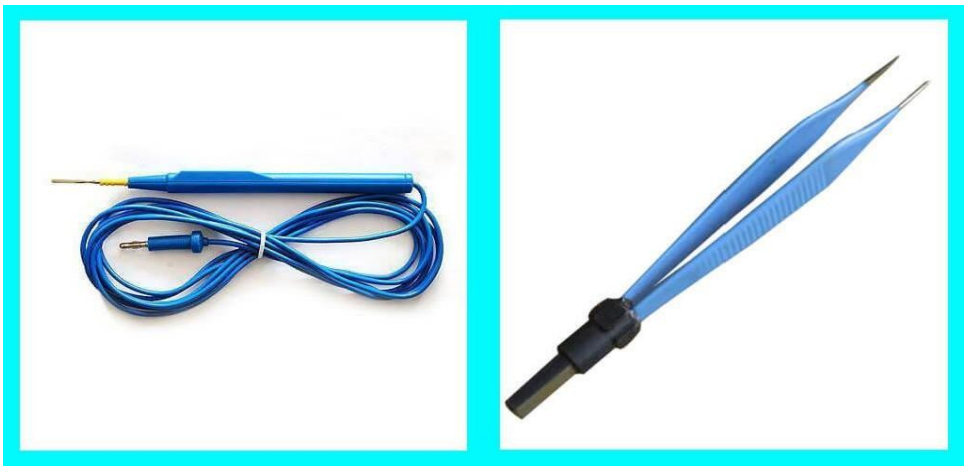
If two items of the same material but of different sizes are examined, for instance, a significant amount of heat is required to increase the temperature of the bigger of the two things by one degree. This is because the larger object has a greater surface area. In addition, the temperature of a specific area will increase much higher when it is heated in comparison to the temperature of the item as a whole when the heat is dispersed uniformly throughout the whole surface of the object.

The term "current density" refers to the amount of electrical current that is concentrated in a certain area. When there is a greater density of current, there will be a corresponding rise in the amount of heat generated. This demonstrates that there is a direct correlation between the increase in temperature in the tissue and the density of the current in that location.

"Rate at which the power is delivered": DC current is the name given to an electrical current that moves in a constant direction. Hertz is the unit of measurement for frequency. Therefore, this has no hertz. AC current, on the other hand, refers to an electrical current that has a variable flow and may be anywhere from one to multiple Hz. Because it is made up of its own intricate network of electrical circuits, the neurological system of the human body is very sensitive to electricity with a low frequency (ranging from 0 Hz to roughly 1000 Hz). When low frequency electricity is applied, it has been shown to activate the nervous system. Even at modest currents, electricity with a low frequency may generate an electric shock, which can result in severe discomfort, muscular spasms, and even cardiac failure in extreme cases. It is important to take notice of the fact that, as frequency increases, the nervous system's sensitivity to the effects of electricity decreases. Therefore, electricity with a frequency that is more than 100 kilohertz does not excite the neurological system.

Electrosurgical equipment is often operated at frequencies ranging from 200 kHz to 5 MHz to reduce the risk of the user experiencing an electric shock.[20]

Common Electrosurgical modalities (Monopolar and Bipolar modalities)



Both monopolar and bipolar modalities are often employed in electrosurgical procedures. Although bipolar modality is not as often utilized as the other two, it is simpler to explain. In this technique, a customized pair of forceps are used to apply a voltage to the patient, with each tine being attached to a different pole of the voltage source. Electrosurgery involves the use of a high frequency electrical current that is passed through

tissue from one tine of a forceps to the other. While the direction of the current reverses at such high frequencies, the heating effect remains the same. The tissue in between is warmed by this method.

In monopolar therapy, the patient is instructed to lay on a metal plate or metalized plastic pad serving as the return electrode. You may find the other electrode of your alternating current power supply attached to this pad. In electrosurgery, the surgeon makes touch with the tissue through a single, sharp probe. When the probe's tip is inserted into a patient, the electrical current may travel from the probe's tip all the way through the patient's body and back to the returning electrode. In this way, the electrosurgical generator receives the returned electrical current.

Individuals may worry that the monopolar modality may cause them to overheat. However, it is clear that the heating is focused only on the tissue closest to the probe. It's because the incoming current disperses so quickly throughout the body. A significant drop in current density follows. Localized heating occurs solely around the probe's tip because the current density there is higher than it is at the body or surface return electrode. When using this method on a finger or penis, for example, care must be used to avoid injury. As a consequence of the small cross-sectional area that their turning current has to spread across, the current density produced by this method is rather high. The full volume of the extremities gets warmed up as a consequence. The whole limb might die as a result of this. For this reason, its use in circumcision should be discouraged.

Prevention of unintended burns in anesthetized patients

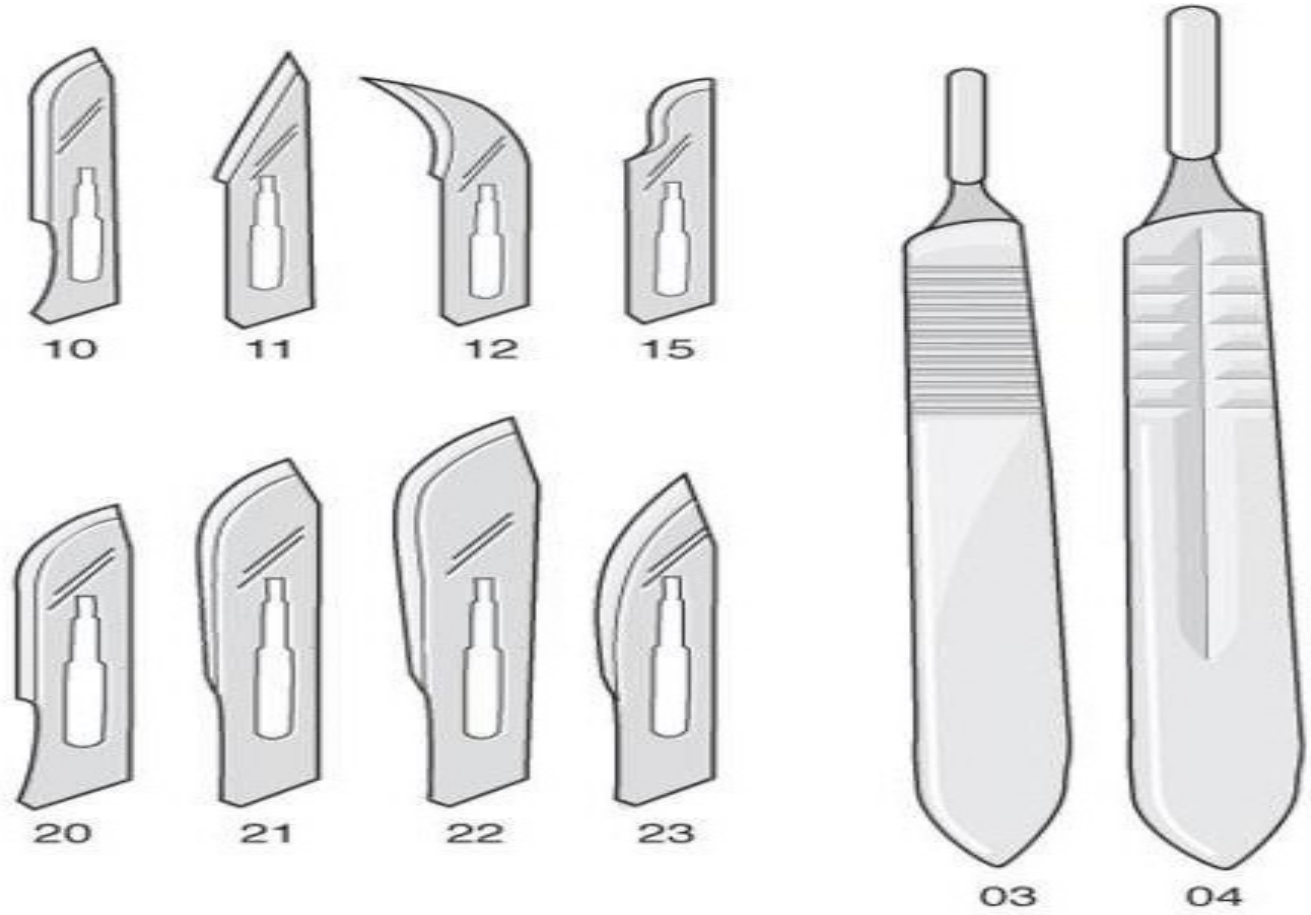
When performing electrosurgery on a patient while they are under general anesthesia, the monopolar mode requires a broad area of electrical contact to be maintained between the patient's body and the returning electrode. If this quantity of suitable contact is not created, it may result in serious burns of the third degree in unanticipated regions on the patient's skin as well as under the skin if the patient is subjected to the procedure. The skin has to be washed and then dried in order to avoid getting the type of accidental burns that might happen.

The next step is to apply a conductive jelly to the skin in order to improve the contact that is made between the plate and the skin. The theater needs to have solid wiring for its electrical systems. In more modern electrosurgical devices, circuit interruption warnings are strongly encouraged to be included. These are the sorts of modalities that can only be used by surgeons who have received specialized training in electrosurgery.

Electrosurgical Waveforms

There are various waveforms that are currently in use in electrosurgical procedures. For tissue cutting purposes, sine wave with a continuous single frequency is generated. This leads to the production of rapid heating. At the microscopic level, this rapid heating leads to boiling and bursting of tissue cells. When looked at the larger scale, this rupturing of cells leads to the tissue tear, making a clean incision.[21]

Scalpel



A scalpel is a highly sharp knife that is used in surgical procedures as well as in the process of dissecting anatomical specimens. Scalpels are either disposable or reusable. Scalpels that can be reused are those that either have blades that are permanently connected and can be sharpened, or blades that are detachable and can be replaced. Inasmuch as Scalpels that are disposable often feature a plastic grip with a blade that can be extended. These blades are only used once before being thrown away completely.[22]

Steel that has been hardened and tempered is often used in the production of scalpel blades. Craft blades may be made of high carbon steel, while medical blades are made of 440c stainless steel. In addition, blades may also be made of materials such as titanium, ceramic, and diamond, all of which are quite pricey. In addition, one cannot utilize metallic blades if the operation is going to be conducted under the supervision of an MRI.

This is due to the fact that steel blades would be pulled towards the magnets, which might result in artifacts being produced. The pressing need for alternatives to scalpels, such as electrocautery and lasers, has now presented itself.[22]

Surgical scalpels are comprised of two components: the blade and the handle. Both of these components are attached to the scalpel. The reusable scalpels with interchangeable blades and handles are the ones that are used the most often. There are two primary varieties of handles used on medical scalpels. One of them is a handle that has a flat surface, and it is used in the #3 and #4 handles. The second one has a rounded front and a flat rear, and it can be seen in the handle for item number 7. The size of a #4 handle is greater than that of a #3. Only a few of the blades are the right size to fit in either handle, while the majority of the rest either have handles that are too big or too narrow to accommodate them.[22]

THE LENGTH AND DIRECTION OF THE INCISION

The incision needs to be designed in an appropriate way and ought to be of a length that is both convenient and long enough to provide enough exposure. Before making a decision on the location of the incision, the surgeon has to take the following into consideration:

- The healing of the wound occurs not from the beginning to the conclusion, but rather from side to side.
- In the region that is being dissected, the arrangement of tissue fibers could be different depending on the kind of tissue.

When incisions are done in a manner that is parallel to the direction in which the problem fibers run, one may get a nice aesthetic outcome. However, this might change depending on the kind of tissue that was examined.[23]

DISSECTION TECHNIQUE

If possible, make the incision with a single, steady stroke of the knife. Sharp dissection should then be used to cut the tissues. It's important to keep the heart, lungs, muscles, and nervous system intact if at all feasible.

Manipulation of Tissues

Healing tissues are greatly aided by proper tissue treatment. Tissues need little handling and the utmost care. Wounds that sustain less damage recover more rapidly. Care must be used while positioning the retractors. The risk of infection and impaired lymphatic drainage are both increased when pressure is applied.

Hemostasis

Dissection is a crucial part of every surgical procedure, and hemostasis plays a pivotal role in this step. The surgeon is able to see more clearly and make more precise incisions in the tissue. Bleeding may be stopped in a variety of ways. Techniques might be classified as either mechanical, thermal, or chemical. 24 Blood in the field prevents the surgeon from seeing the structures clearly if hemostasis is not established. Before sealing the incision, be sure that all bleeding has stopped completely. A hematoma may be avoided in that way.

If the cut bleeds too much, the resulting hematoma might cause complications. And it has the potential to spread disease. Vigilance is required while ligating a vessel, and unnecessary clamping of a significant volume of tissue should be avoided.[4] It's possible that this might cause tissue damage. Tissue death and necrosis may result from this. This might put you at risk for a sluggish recovery from wounds.

MATERIALS AND METHOD

MATERIALS AND METHOD

This prospective randomized clinical study entitled "**Comparison of the outcome of diathermy V/s scalpel skin incision in surgical cases**" was conducted after clearance from Board of Studies and Ethical committee in the Department of General Surgery, Santosh Medical College & Hospital, Ghaziabad (UP), India.

Place of study: Santosh Medical College & Hospital Duration of study: 1.5 years

Type of study: Prospective interventional study

Sample size: 200 patients

$n=2\ (Z1-\alpha/a + Z1-\beta)2\ \sigma2$

$(\mu1-\mu2)2$

$Z\alpha=1.96$ at 5% level of significance

$Z\beta=1.28$ at 90% power of test

U1=mean of reference group

U2=Mean of test group

σ = pooled standard deviation

the sample size is

n= 100 each group

Total = 200

Randomization

• Group A: 100 Patients Scalpel Group

• Group B: 100 Patients Diathermy Group

Inclusion Criteria

1. Patients of both sexes

2. Age: between 14-80years

3. Elective surgeries of:

- Thyroid
- Breast
- Abdomen
- Superior & Inferior extremities
- Thorax

Exclusion Criteria

1. Incision over previous scar
2. Previous H/o Hypertrophic scar/Keloid.
3. Patients with skin diseases (psoriasis, eczema) and connective tissue disorders (ehlardanlos and marfanssyndrome)
4. Patients with bleeding dyscrasias.
5. Patients with h/o burns and contractures
6. Patient unfit for surgery.

Study procedure

Following receipt of clearance from the institution's ethical committee, patients were chosen for the study based on whether or not they met the inclusion and exclusion criteria. All of the patients were given a thorough medical history, in-depth physical examinations, and investigations that were both standard and appropriate.The patient's medical history, physical examination, laboratory testing, imaging, surgical procedure, and recuperation were all documented. The patients were given information on the upsides and downsides of both incision options, and their informed consent was acquired.

For their respective surgeries, each patient received either a general, spinal, or local anesthetic as appropriate. Antibiotic prophylaxis was administered intravenously in the form of cefuroxime, cefotaxime, ciprofloxacin, imipenem, or metronidazole (either alone or in combination) at the time anesthesia was induced; the dosage was repeated once after 12 hours in patients who were clean, or for a longer period of time in other circumstances. Oral amoxicillin and clavulanic acid were prescribed to patients after they had a local anesthetic. In group B, incisions were made in the skin and/or the subcutaneous tissue using either a diathermy pen electrode with the cutting mode turned on or a knife (group A). Following the use of coagulation diathermy to establish hemostasis in both sets of patients, major subcutaneous veins were ligated with sutures and then sutured closed.

Statistical analysis

After the data were imported into Microsoft Excel, the statistical analysis was performed using the statistical application SPSS version 21.0. This took place after the analysis was completed. The qualitative information (variables that fall into the category of categories) was presented as frequency and percentage, while the quantitative information (variables that fall into the category of numbers) was presented as mean and standard deviation.

Between the two groups, we compared the frequency of occurrences using the chi-square test, and we applied the student t-test to analyse the differences in mean values. If the p-value was less than 0.05, then the findings were considered to be significant.

RESULTS & OBSERVATIONS

RESULTS

Table 1: Distribution of study population according to age

	Age				
Groups	Mean	Std. Deviation	t-test value	p-value	Mean Difference
Scalpel	41.69	16.70	0.096	0.924	0.23
Diathermy	41.46	17.20			

Th e sample size is 200 with 100 in group A representing scalpel & 100 in group B representing diathermy. The mean Age was compared between Scalpel and Diathermy groups using the unpaired t-test. There was no significant (p-value > 0.05) difference in mean Age between Scalpel (41.69±16.70) and Diathermy (41.46±17.20) groups.

The mean age of the both the groups was 41-42 years.

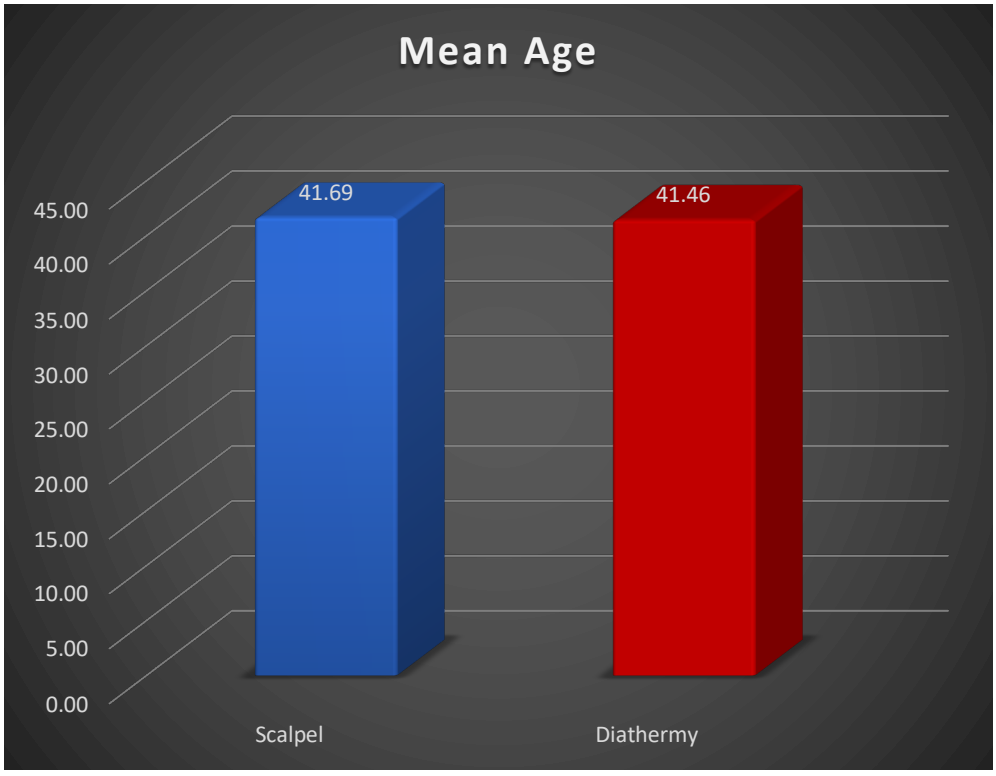


Table 2: Distribution of study population according to Gender

Gender	Scalpel	Diathermy	Total
Male	56	56	112
	56.0%	56.0%	56.0%
Female	44	44	88
	44.0%	44.0%	44.0%

The sample size is 200 with 100 in group A representing scalpel & 100 in group B representing diathermy.

The distribution of males and females was compared between Scalpel and Diathermy groups using the chi-square test. There was no significant difference (p-value > 0.05) in distribution of males and females between Scalpel and Diathermy groups.

There were 56.0% males and 44.0% females out of their respective 100%.

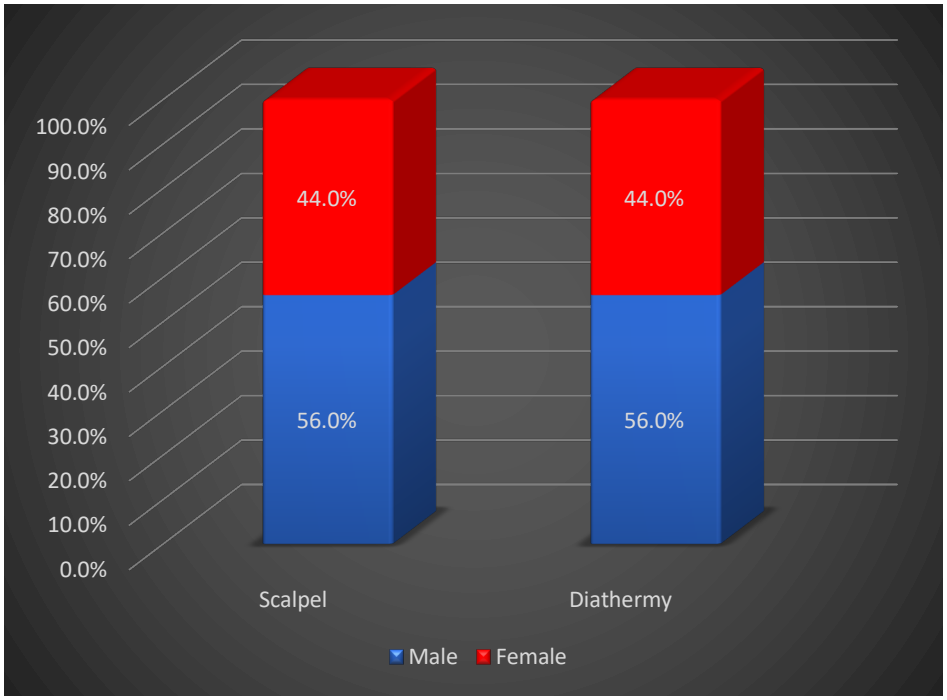


Table 3: Distribution of study population according to blood haemoglobin

	Blood Haemoglobin				
Groups	Mean	Std. Deviation	t-test value	p-value	Mean Difference
Scalpel	11.96%	1.23%	-0.058	0.954	-0.01%
Diathermy	11.97%	1.23%			

The sample size is 200 with 100 in group A representing scalpel & 100 in group B representing diathermy.

The mean Blood Haemoglobin was compared between Scalpel and Diathermy groups using the unpaired t-test. There was no significant ($p > 0.05$) difference in mean Blood Hb between Scalpel (11.96%±1.23%) and Diathermy (11.97%±1.23%) groups. Normal Hb range varies from 9gm% - 15gm% ,wherein both the groups had a mean of 11-12 gm% as per proper PAC fitness requirement.

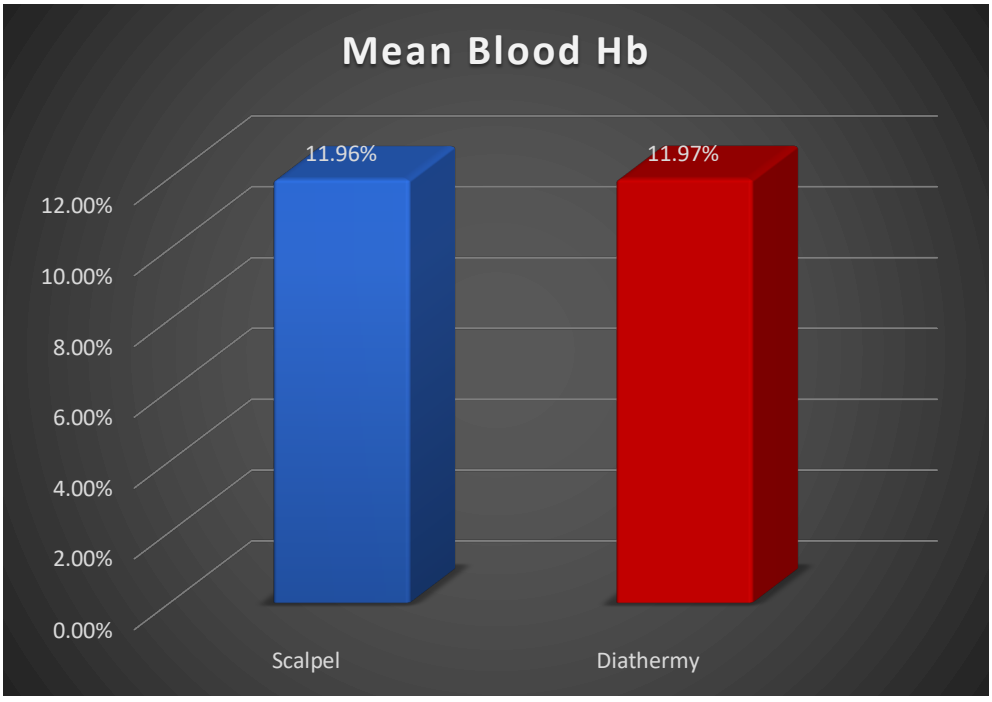


Table 4: Distribution of study population according to Total Leucocyte Count

	TLC				
Groups	Mean	Std. Deviation	t-test value	p-value	Mean Difference
Scalpel	8410.00	3956.98	-0.221	0.825	-125.00
Diathermy	8535.00	4023.98			

The sample size is 200 with 100 in group A representing scalpel & 100 in group B representing diathermy. The normal TLC ranges varies from 4000/cumm – 11000/cumm.

Mean was 8410 – 8535 out of these ranges for the groups respectively.

The mean TLC was compared between Scalpel and Diathermy groups using the unpaired t-test. There was no significant (p-value > 0.05) difference in mean TLC between Scalpel (8410.00±3956.98) and Diathermy (8535.00±4023.98) groups.

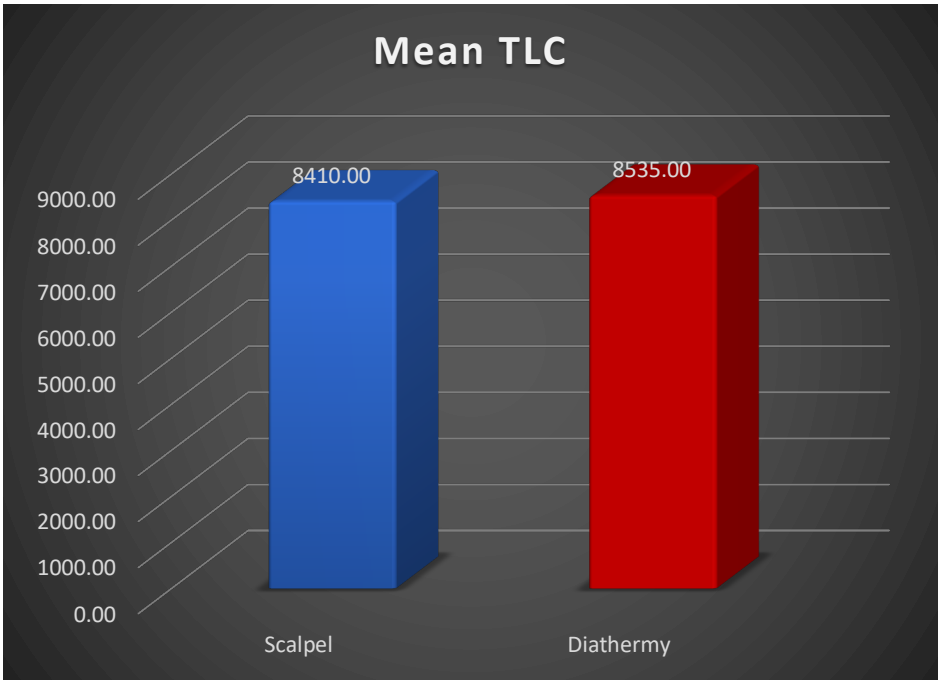


Table 5: Distribution of study population according to gauze soaked

	Gauze Soaked				
Groups	Mean	Std. Deviation	t-test value	p-value	Mean Difference
Scalpel	6.54	6.63	4.109	0.001*	4.41
Diathermy	2.13	1.70			

The sample size is 200 with 100 in group A representing scalpel & 100 in group B representing diathermy. The mean Gauze Soaked was compared between Scalpel and Diathermy groups using the unpaired t-test. There mean Gauze Soaked was significantly more among Scalpel group compared to Diathermy group. The mean Gauze Soaked among Scalpel and Diathermy groups was 6.54±6.63 and 2.13±1.70 respectively.

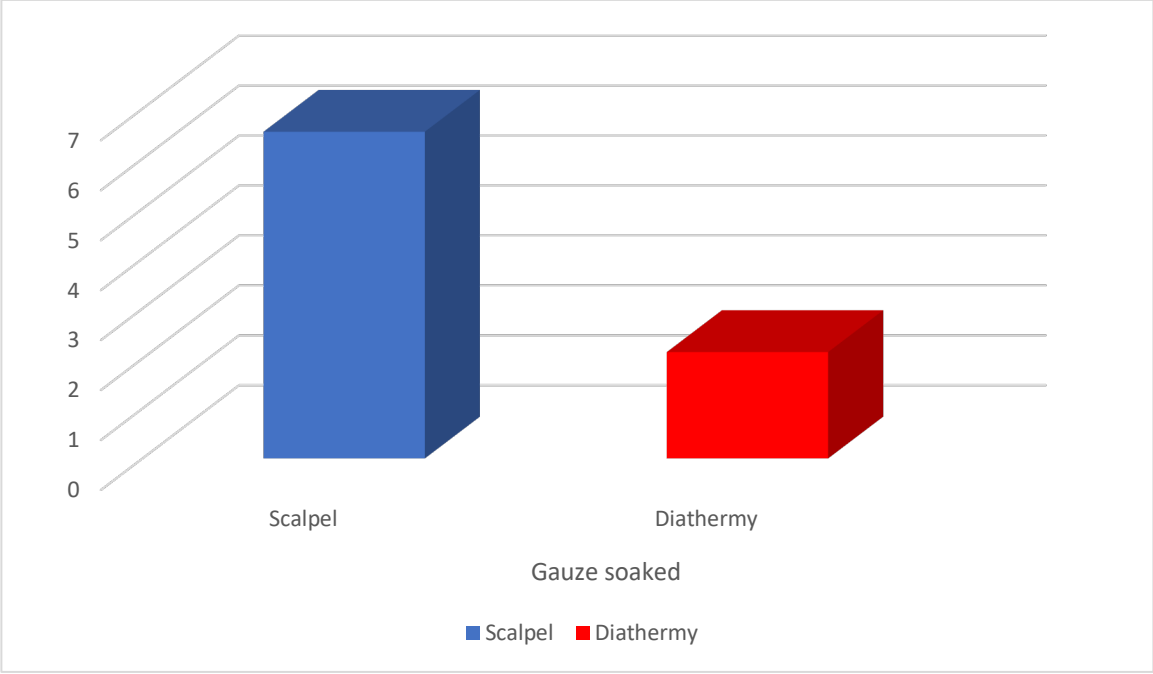


Table 6: Distribution of study population according to duration of stay in the hospital

	Duration of stay in hospital				
Groups	Mean	Std. Deviation	t-test value	p-value	Mean Difference
Scalpel	3.05	2.00	4.098	0.042*	2.04
Diathermy	1.01	2.01			

The sample size is 200 with 100 in group A representing scalpel & 100 in group B representing diathermy. The mean Duration of stay in hospital was compared between Scalpel and Diathermy groups using the unpaired t-test. There was a significant (p-value < 0.05) difference in mean Duration of stay in hospital between Scalpel and Diathermy groups with significantly higher mean stay among Scalpel group. The mean Duration of stay in hospital among Scalpel and Diathermy groups was 3.05±2.00 and 1.01±.01 respectively.

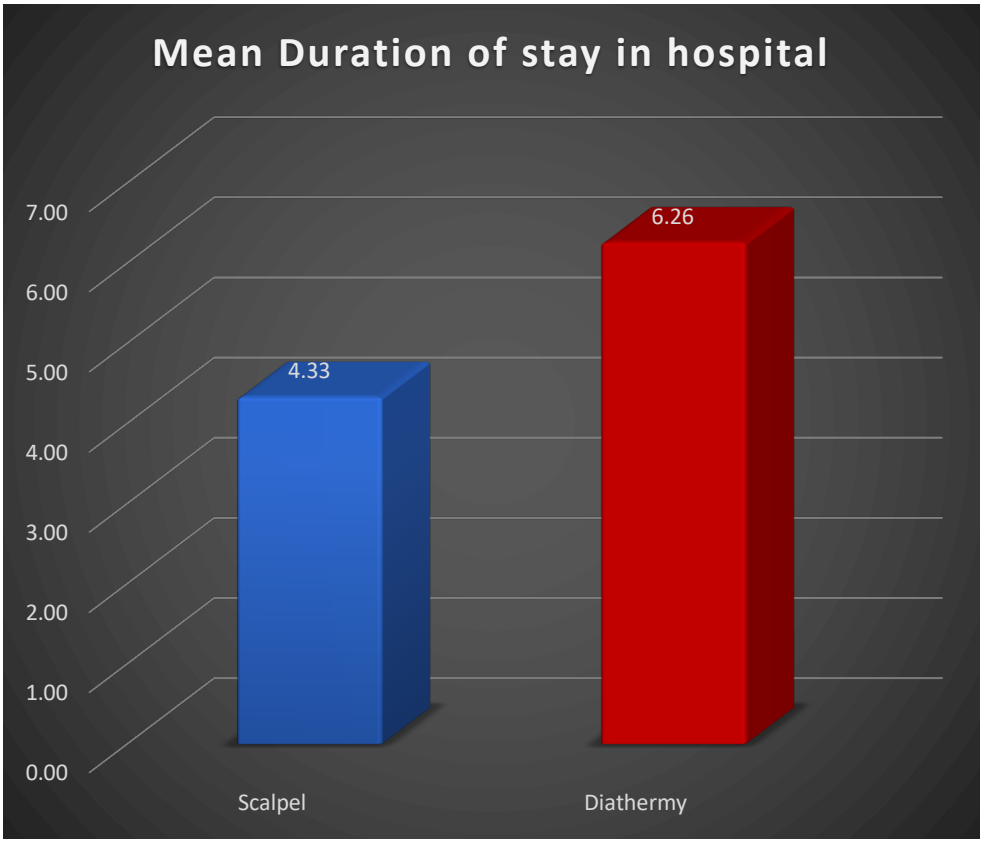


Table 7: Distribution of study population according to separation of deep tissue

Separation of Deep Tissue	Scalpel	Diathermy	Total
0		79	158
	79.0%	79.0%	79.0%
1	3	3	6
	3.0%	3.0%	3.0%
2	13	13	26
	13.0%	13.0%	13.0%
3	1	1	2
	1.0%	1.0%	1.0%
5	2	2	4
	2.0%	2.0%	2.0%
Burst Abdomen	2	2	4
	2.0%	2.0%	2.0%
χ^2 value = 0.000, p-value = 1.000			

The sample size is 200 with 100 in group A representing scalpel & 100 in group B representing diathermy.

0-5 is the scoring on Asepsis scoring criteria.

The distribution of Separation of Deep Tissue was compared between Scalpel and Diathermy groups using the chi-square test. There was no significant difference in distribution of Separation of Deep Tissue between Scalpel and Diathermy groups. Burst Abdomen was reported among 2 (2.0%) each.

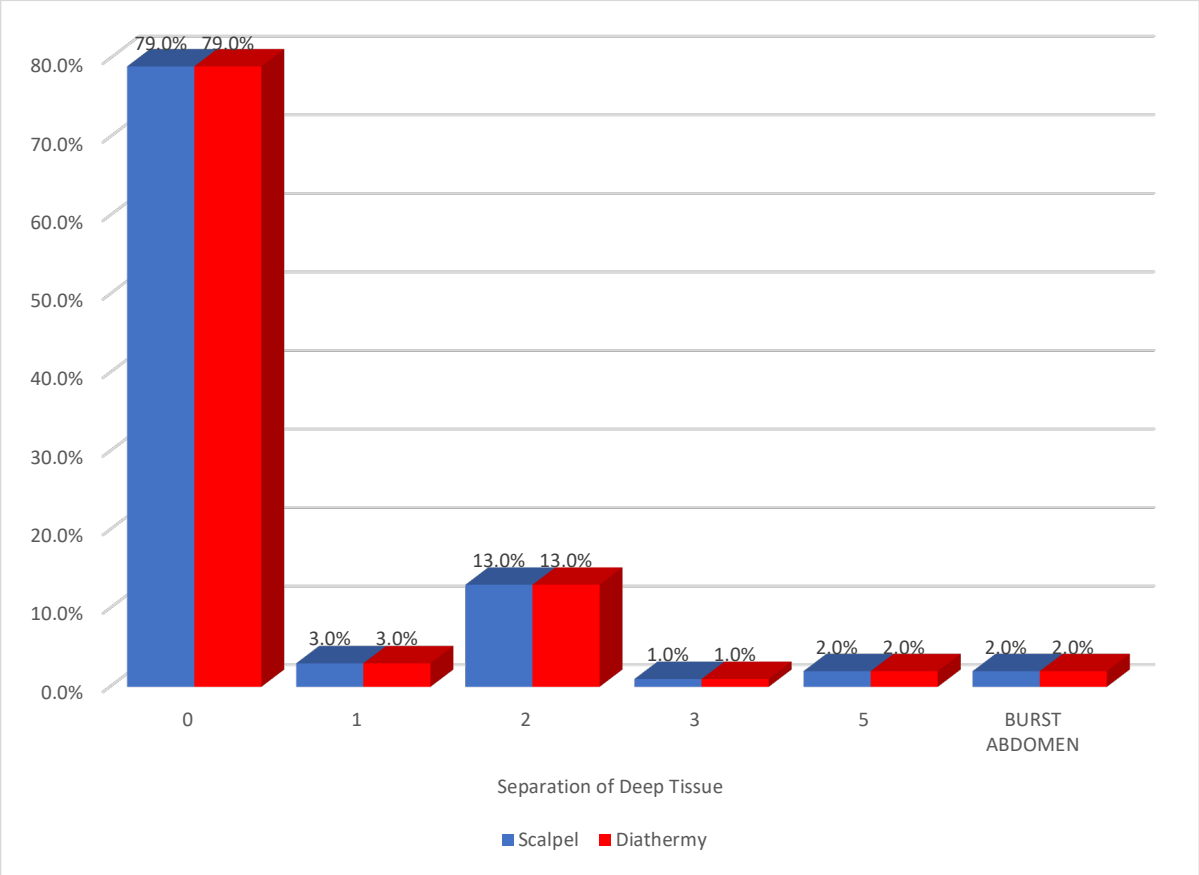

79.0%
79.0%
3.0%
3.0%
13.0%
13.0%
1.0%
1.0%
2.0%
2.0%
2.0%
2.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0
1
2
3
5
BURST ABDOMEN
Separation of Deep Tissue
Scalpel
Diathermy

Table 8: Distribution of study population according to pus culture obtained

	Groups		Total
Pus C & S	Scalpel	Diathermy	
N/A	94	98	192
	47.00%	49.00%	96.0%
Sterile	6	2	8
	3.0%	1.0%	4.0%
χ^2 value = 0.000, p-value = 1.000			

The sample size is 200 with 100 in group A representing scalpel & 100 in group B representing diathermy. The distribution of Pus C & S was compared between Scalpel and Diathermy groups using the chi-square test. There was no significant difference in distribution of Pus C & S between Scalpel and Diathermy groups. Sterile sample were reported among 6 (6.0%) each.

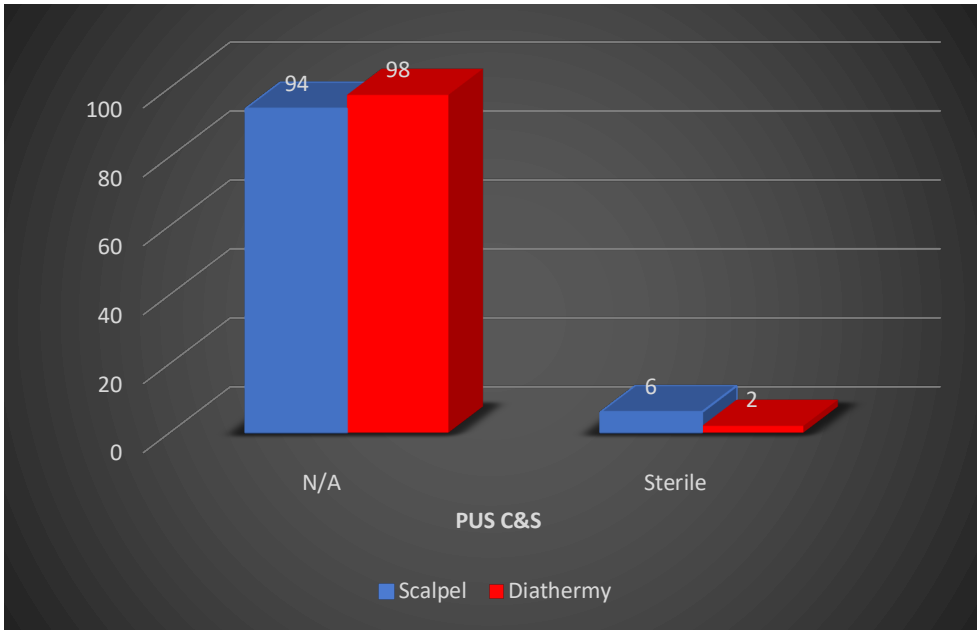


Table 10: Distribution of study population according to

POD of Suture Removal	Groups		Total
	Scalpel	Diathermy	
N/A	5	2	7
	5.0%	2.0%	3.5%
4	1	0	1
	1.0%	0.0%	0.5%
7	80	82	162
	80.0%	82.0%	81.0%
10	10	5	15
	10.0%	5.0%	7.5%
12	2	8	10
	2.0%	8.0%	5.0%
14	2	3	5
	2.0%	3.0%	2.5%
15	0	0	0
	0.0%	0.0%	0.0%
20	0	0	0
	0.0%	0.0%	0.0%
χ^2 value = 0.032, p-value = 1.000			

The distribution of POD of Suture Removal was compared between Scalpel and Diathermy groups using the chi-square test. There was no significant difference in distribution of POD of Suture Removal between Scalpel and Diathermy groups.

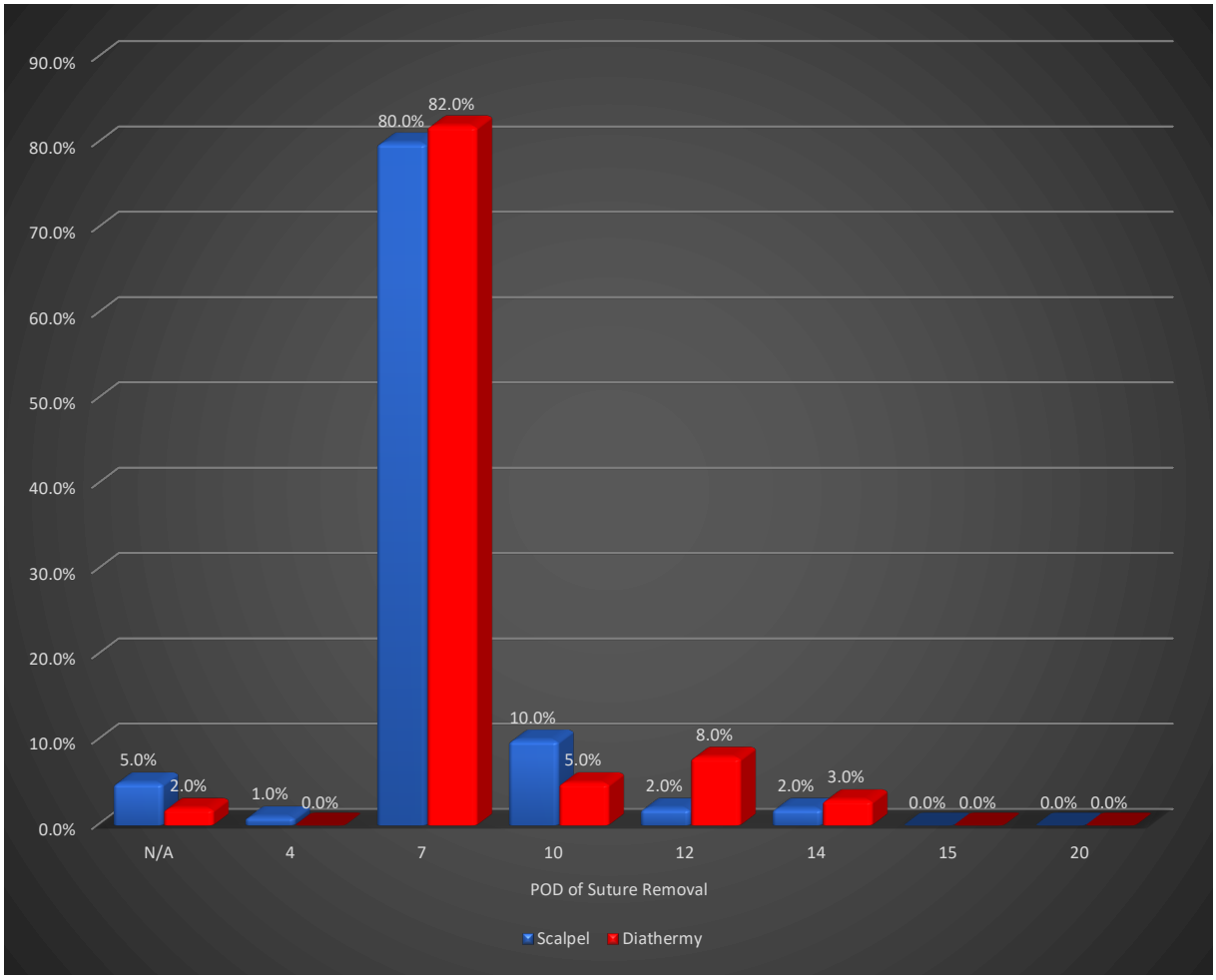


Table 11: Distribution of study population according to

Inference	Groups		Total
	Scalpel	Diathermy	
Good prognosis	78	93	171
	78.0%	93.0%	85.5%
Poor wound healing	13	3	16
	13.0%	3.0%	8.0%
Severely infected wound	9	4	13
	9.0%	4.0%	6.5%
χ^2 value = 8.092, p-value = 0.021*			

The distribution of Inference was compared between Scalpel and Diathermy groups using the chi-square test. There was a significant difference in distribution of Inference between Scalpel and Diathermy groups. There was Good prognosis among 78.0%, Poor wound healing among 13.0% and Severely infected wound among 9.0% in Scalpel group. There was Good prognosis among 93.0%, Poor wound healing among 3.0% and Severely infected wound among 4.0% in Scalpel group.

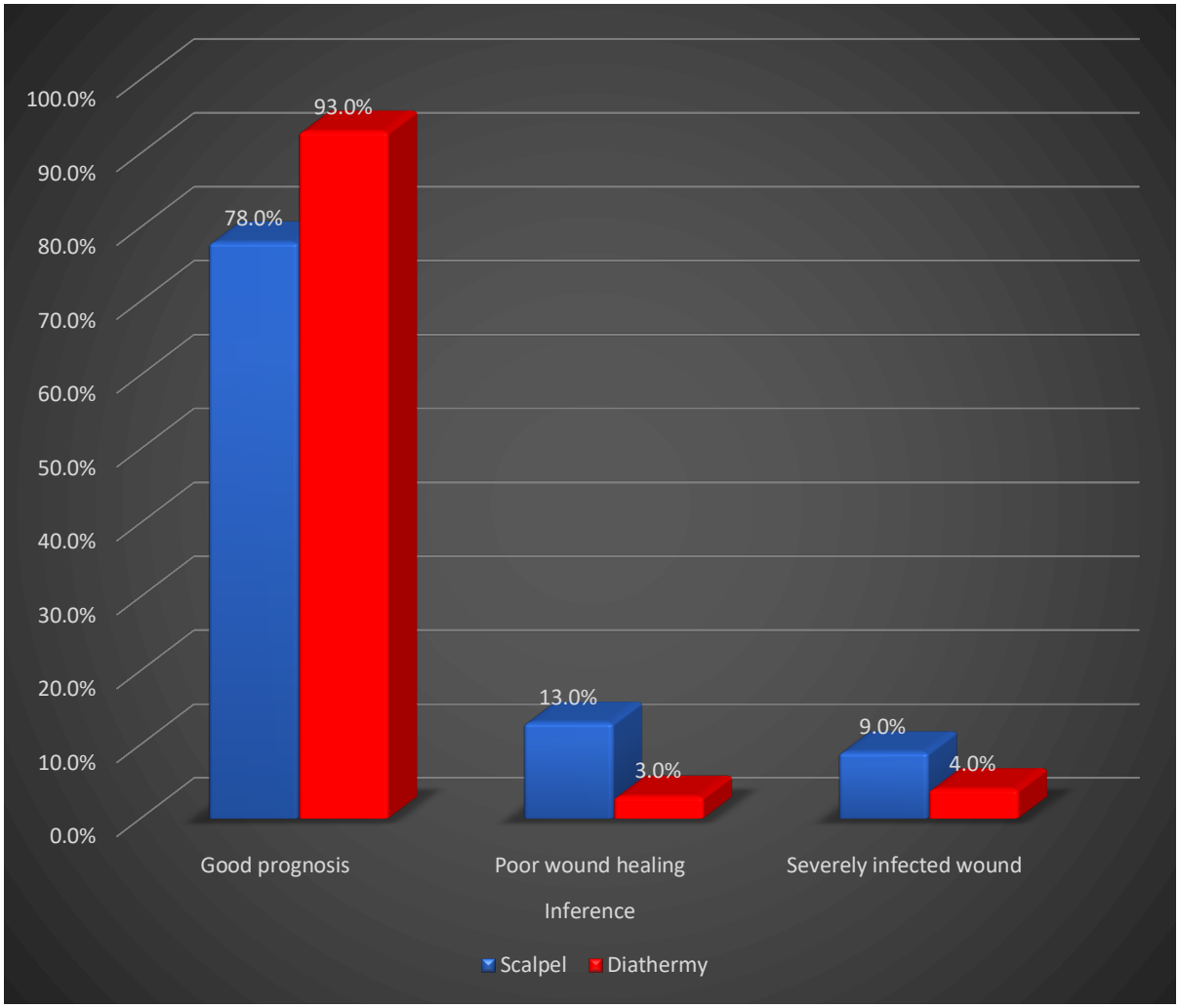

100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
78.0%
93.0%
13.0%
3.0%
9.0%
4.0%
Good prognosis
Poor wound healing
Severely infected wound
Inference
Scalpel
Diathermy

Table 12: Distribution of study population according to

Erythema	Groups		Total
	Scalpel	Diathermy	
0	96	92	188
	96.0%	92.0%	94.0%
1	3	1	4
	3.0%	1.0%	2.0%
2	1	3	4
	1.0%	3.0%	2.0%
3	0	2	2
	0.0%	2.0%	1.0%
4	0	2	2
	0.0%	2.0%	1.0%
5	0	0	0
	0.0%	0.0%	0.0%
χ^2 value = 3.154, p-value = 1.000			

The distribution of Erythema was compared between Scalpel and Diathermy groups using the chi-square test. There was no significant difference in distribution of Erythema between Scalpel and Diathermy groups. There was score 0 among 96.0%, score 1 among 3.0%, score 2 among 1.0%, score 3 score 4 and score 5 among 0.0% subject among Scalpel group. There was score 0 among 92.0%, score 1 among 1.0%, score 2 among 3.0%, score 3 among 2.0%, score 4 among 2.0% and score 5 among 0.0% subjects among Diathermy group.

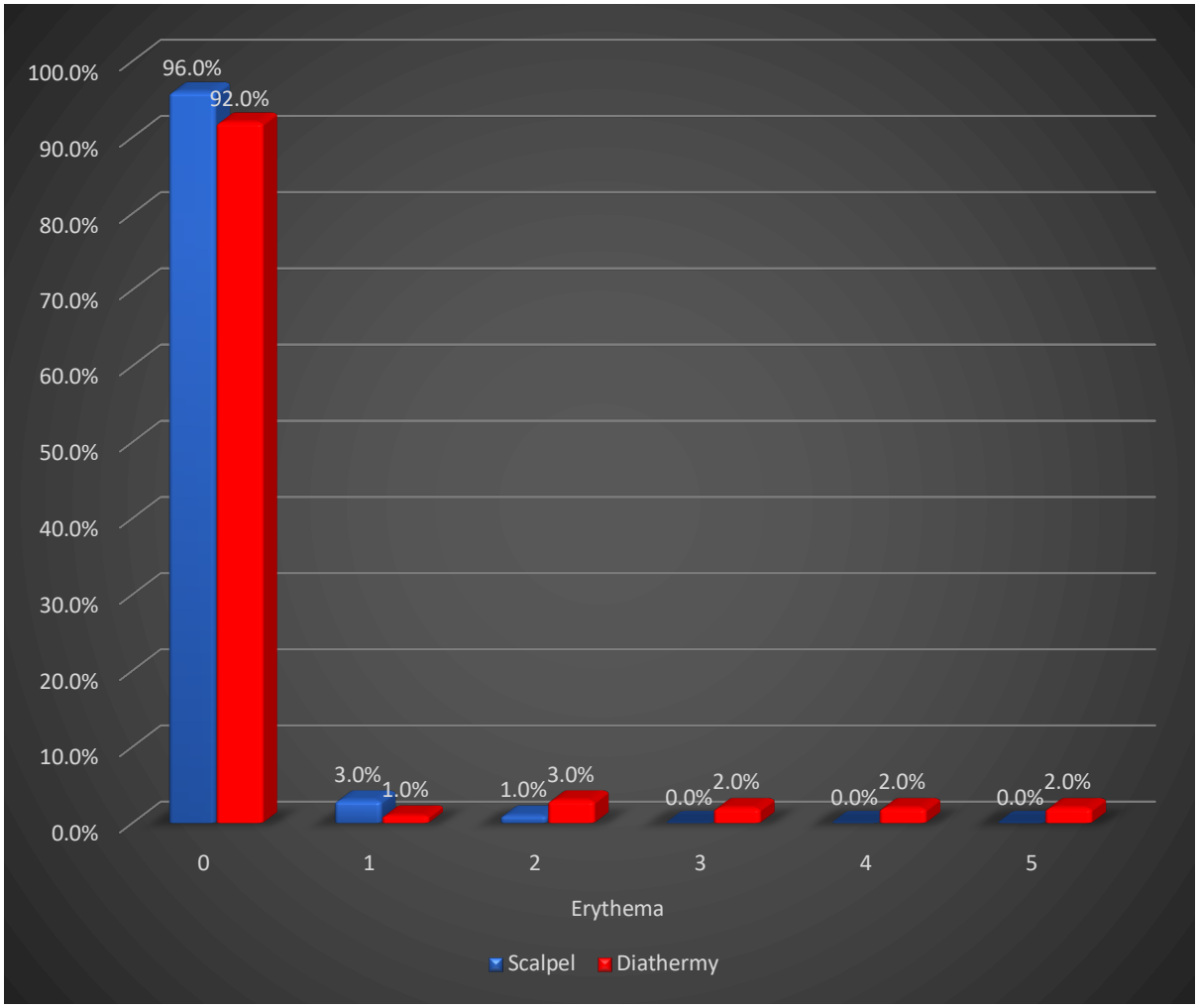

100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
96.0%
92.0%
3.0%
1.0%
1.0%
3.0%
0.0%
2.0%
0.0%
2.0%
0.0%
2.0%
0
1
2
3
4
5
Erythema
Scalpel
Diathermy

Table 13: Distribution of study population according to

Discharge	Groups		Total
	Scalpel	Diathermy	
0	93	95	188
	93.0%	95.0%	94.0%
1	2	4	6
	2.0%	4.0%	3.0%
2	3	1	4
	3.0%	1.0%	2.0%
3	2	0	2
	2.0%	0.0%	1.0%
4	0	0	0
	0.0%	0.0%	0.0%
5	0	0	0
	0.0%	0.0%	0.0%
χ^2 value = 2.028, p-value = 0.239			

The distribution of Discharge was compared between Scalpel and Diathermy groups using the chi-square test. There was no significant difference in distribution of Discharge between Scalpel and Diathermy groups. There was score 0 among 93.0%, score 1 among 2.0%, score 2 among 3.0%, score 3 among 2.0%, score 4 among 0.0% and score 5 among 0.0% subjects among Scalpel group. There was score 0 among 95.0%, score 1 among 4.0%, score 2 among 1.0%, score 3 among 0.0%, score 4 among 0.0% and score 5 among 0.0% subjects among Diathermy group.

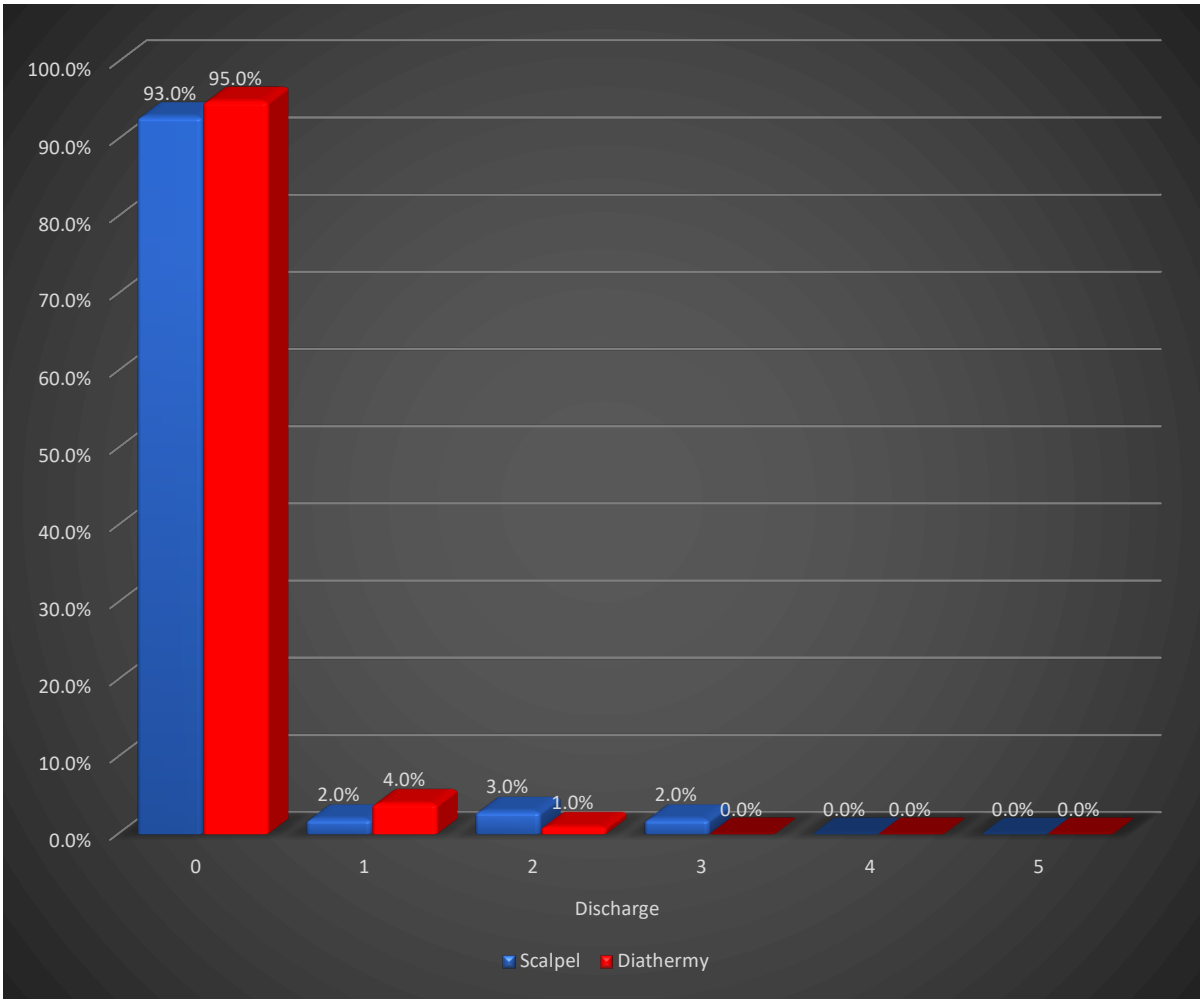

100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
93.0%
95.0%
2.0%
4.0%
3.0%
1.0%
2.0%
0.0%
0.0%
0.0%
0.0%
0.0%
0
1
2
3
4
5
Discharge
Scalpel
Diathermy

Table 14: Distribution of study population according to

Post-operative Pain	Groups		Total
	Scalpel	Diathermy	
0	44	65	109
	44.0%	65.0%	54.5%
1	21	16	37
	21.0%	16.0%	18.5%
2	18	12	30
	18.0%	12.0%	15.0%
3	7	4	11
	7.0%	4.0%	5.5%
4	5	3	8
	5.0%	3.0%	4.0%
5	5	0	5
	5.0%	0.0%	2.5%
χ^2 value = 4.041, p-value = 0.040*			

The distribution of Post-operative Pain was compared between Scalpel and Diathermy groups using the chi-square test. There was a significant difference in distribution of Post-operative Pain between Scalpel and Diathermy groups. There was score 0 among 44.0%, score 1 among 21.0%, score 2 among 18.0%, score 3 among 7.0%, score 4 among 5.0% and score 5 among 5.0% subjects among Diathermy group. There was score 0 among 65.0%, score 1 among 16.0%, score 2 among 12.0%, score 3 among 4.0%, score 4 among 3.0% and score 5 among 0.0% subjects among Scalpel group.

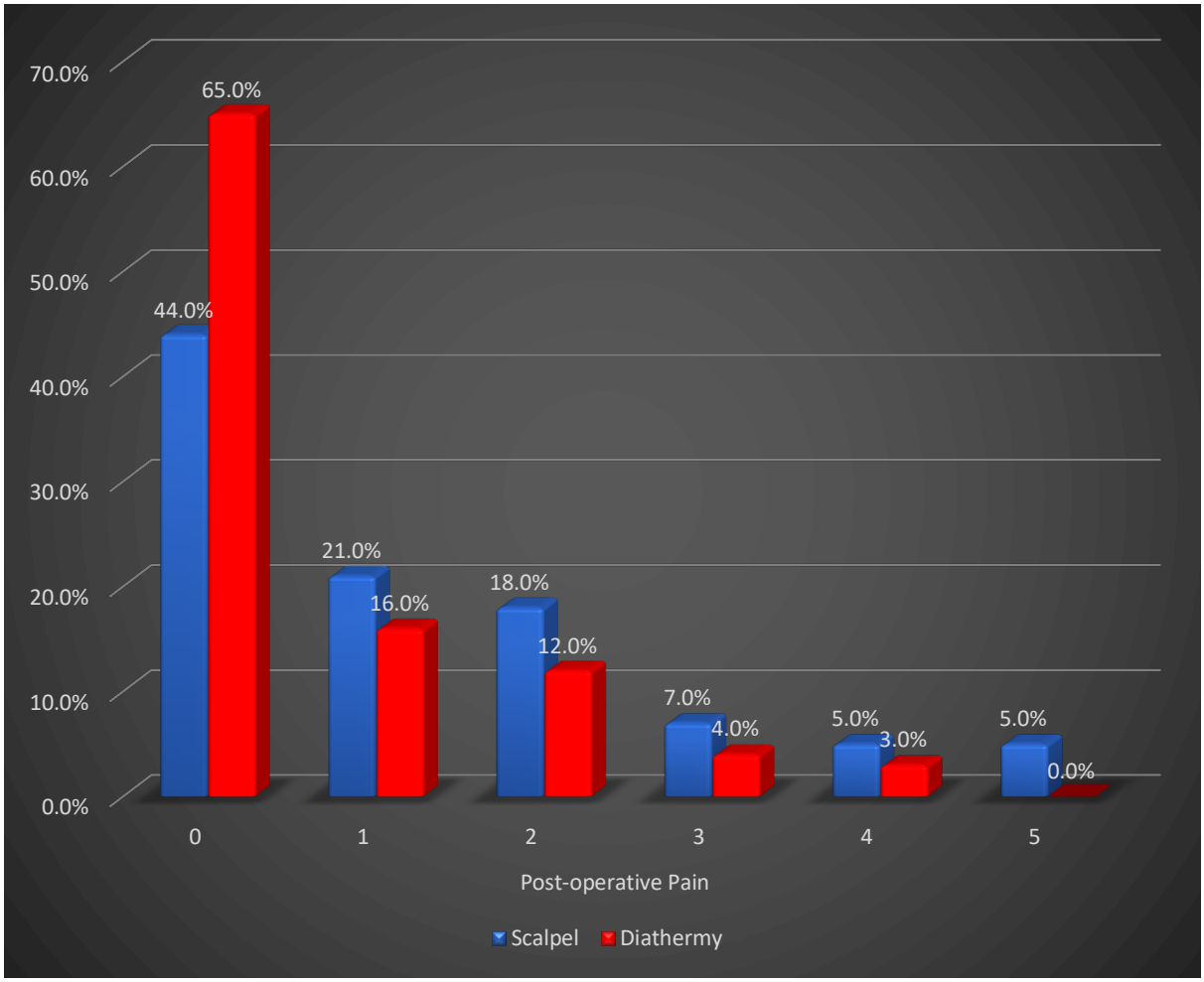
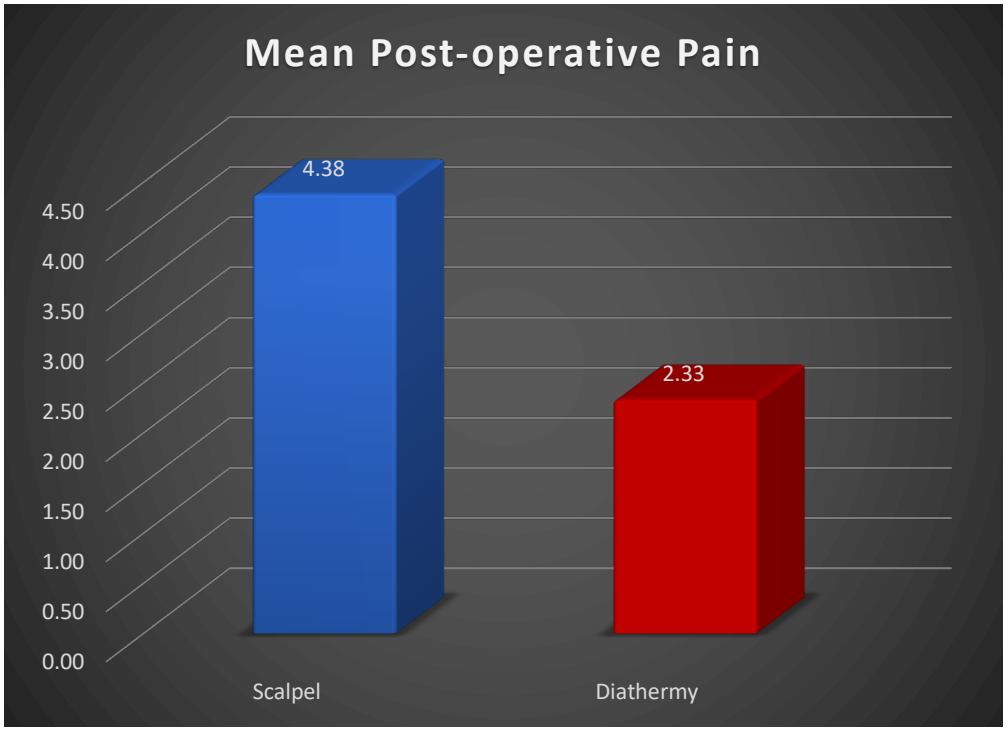

70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
65.0%
44.0%
21.0%
16.0%
18.0%
12.0%
7.0%
4.0%
5.0%
3.0%
5.0%
0.0%
0
1
2
3
4
5
Post-operative Pain
Scalpel
Diathermy

Table 15: Distribution of study population according to

	Post-operative Pain				
Groups	Mean	Std. Deviation	t-test value	p-value	Mean Difference
Scalpel	4.38	1.82	0.194	0.846	0.05
Diathermy	2.33	1.82			

The mean Post-operative Pain was compared between Scalpel and Diathermy groups using the unpaired t-test. The mean Post-operative Pain among Scalpel and Diathermy groups was 4.38±1.82 and 2.33±1.82 respectively. The mean Post-operative Pain was significantly more among Scalpel group compared to Diathermy group.



DISCUSSION

DISCUSSION

Since the advent of sophisticated electrocautery equipment, there has been a growing trend toward using diathermy to make skin incisions.[49]Electrosurgical incisions appeared to have better haemostasis and shorter duration of stay in the hospital due to wound infection.

Scalpels on the other hand have been the most sought after & preferred tool in the surgeons armamentarium, but with increasing trends of minimal invasive surgeries & damage control surgeries, scalpels have been easily replaced on the basis of easy haemostasis & lesser incision time, to increase the ease of the operating surgeon.

In present study, there was no significant difference in mean Age between Scalpel and Diathermy, the mean was 41.69 for scalpel & 41.46 for diathermy .*Mageed A.A. et al*.[48]found thatthe mean age was 29.31 (5.4) years. *Furqan M et al*.[36]stated that the mean age of the patients in the diathermy group was 39.26±7.04 years, whereas the mean age of the patients in the scalpel group was 45.96+/-5.28 years, which is cohesive & supporting of our findings as well

In our study, there was no significant difference in distribution of males and females between Scalpel and Diathermy groups. There were 56.0% males and 44.0% females.*Agarwal D et al*.[46] found that Males outnumbered females by 148 to 110 of the 258 cases. *Furqan M et al*.[36]stated that Male patients outnumbered female patients by a ratio of 55 to 45.

There was significant difference in mean Gauze Soaked between Scalpel and Diathermy groups.As in trials, diathermy vs. scalpel showed statistically significant shorter incision time and reduced blood loss, by the scalpel .[33]*Guru A.K. et al*. reported that the median blood loss was 10ml in cases and 15ml in controls, a statistically significant difference. *Abdelaal N et al*.[37] using diathermy in skin incision during abdominal surgical procedures resulted in less blood loss. There was increase in postoperative discomfort & disturbed wound when scalpel was used for abdominal skin incisions.

Sheikhet al.[50] discovered that employing an electrocautery scalpel required much less time and blood loss during skin opening than a steel scalpel, with just one wound dehiscence in 177 skin incisions for neurosurgery operations. *Pearlman et al*.[10] compared carbon dioxide laser, scalpel, or electrosurgical incisions, they discovered that electrosurgery had a shorter incision time and less incisional blood loss than either the carbon dioxide laser or the scalpel, but that all three methods' postoperative discomfort and wound healing rates were the different & scalpel had most time taken & blood loss.

Pandey S. et al.[39] stated that Group A (Scalpel) experienced statistically greater mean blood loss than Group B (Diathermy) (3.4 1.5 mL vs. 2.6 1.5 mL, respectively). These results are comparable to those of Talpur Aet al.[23] who found that electrocautery reduced mean incision time and mean blood loss by a statistically significant amount when compared to scalpel.

Similar to this, *Ly J et al*. found that diathermy incisions resulted in significantly less blood loss (mean difference of 0.72 mL/cm2 (p0.001) and shorter incision times (mean difference of 36 seconds; p0.001) than scalpel incisions when comparing 14 randomised trials with 2541 patients (1267 undergoing abdominal wall incision by cutting diathermy and 1274 by scalpel).[51]

Surgeons need several stitches, numerous tools, and coagulation diathermy, especially with subcutaneous tissue, to achieve haemostasis with a scalpel incision. When compared to diathermy, such haemostatic treatments take longer to complete using a knife. According to several studies, diathermy incisions result in less blood loss than knife incisions.[49,52,53] This outcome might be attributed to diathermy's coagulative action, which is crucial for maintaining the haemostatic state of the incision site. But Prakash et al.[52] observed no distinction in incision time. The fact that they analyzed midline skin incision rather than Pfannenstiel skin incision may be the cause of this discrepancy.

In current study, there was significant difference in mean Duration of stay in hospital between Scalpel and Diathermy groups. Scalpel mean values were 3.05 and diathermy mean values were 1.01. which indicated a relatively shorter hospital stay when the incision was taken by the diathermy.*Agarwal D et al*.[46]reported that average hospital stay in Group I was 8.4 days and 10.2 days in Group II.*C*

Based on separation of deep tissue in our study the scoring was done by the south hampton criteria & asepsis scoring on a grading of 0-5 with respect to the proportion of the wound infected, 79% of scalpel groups had a fairly good outcome of no separation of deep tissues whereas, burst abdomen was reported in 2 patients of contaminated wounds due to penetrating trauma & perforation peritonitis. Amongst the diathermy group similar results were obtained, 79% of the patients had no separation of deep tissue where as 2 patients were reported to have burst abdomen due to nosocomial infections following a emergency exploratory laparatomy that was determined by the pus C/S if of the wound. *sharmil D et al*.[47]reported that the outcome following scalpel & diathermy incision were not only due to the mode chosen to take the inscision but also the etiology of the wound & post operative wound care, results of their study shows no significant difference between scalpel and diathermy with 85% of group A not having any separation of deep tissues & 88% of group B having a score of 0 indicating no separation of deep tissue.

Based on the Pus culture & sensitivity obtained 94 out of 100 patients enrolled showed no discharge in the group A representing the scalpel whereas 98 ou of 100 patients enrolled in group B showed no discharge hence the pus culture & sensitivity was N/A. 6 out of 100 patients in group A has sterile pus culture & similiarly 2 out of 100 patients had a sterile outcome. Data to support pus culture & sensitivity following diathermy & scalpel incions as a comparative study is scarce & cannot be discussed here due to differences in the types of studies.

On the basis of suture removal, most of the sutures are removed on the 7^{th} and the 10^{th} day, in group A representing scalpel, on the 7^{th} day 80 out of 100 patients had suture removal done & in group B representing diathermy, 82 out of 100 patients had their sutures removed, timely suture removal is suggestive of good wound healing not associated with any discharge.

Similar to this, *Haroon et al*. found that during follow up visits the patients in group 1 scalpel had most of their sutures removed during the first weekly visit of a few days later around the 10^{th} day & group 2 had most of their sutures removed around 7^{th} & 10^{th} day. Group 1 showing, 90% of the patients with suture removal on 7^{th} day & remaining on 10^{th} day. Group 2 showing 95% of the patients with suture removal on 7^{th} day & remaining on 10^{th} day.

On the basis of Erythema in our study, 96 out of 100 people showed no erythema for the patients operated by scalpel & 92 out of 100 people showed no erythema. No severe wound infection was seen in either of the groups A & B. Slight erythema was seen with a scoring of 1 in groups A & B with 1 & 3 % respectively.

In our study, there was significant difference in distribution between Scalpel and Diathermy groups. On the basis of wound infection, blood loss & incision time, diathermy was found to be far superior even surgeon's operating comfort was better

If used correctly, with a cautery pad attachment to prevent cautery burns & on proper settings, Diathermy can be a very good alternative to the classical scalpel in certain operative criterions.

Mageed A.A. et al.[48]found that Diathermy skin incision outperforms scalpel skin incision in terms of postoperative discomfort and wound healing.*Mukherjee MP et al*.[47] found that diathermy provided effective skin cutting with no enhanced wound-healing profile compared to a standard scalpel blade.*Okereke C.E. et al*.[42]reported that the mean scar satisfaction score for the diathermy incised wounds was higher, although this was not statistically significant. *Mahmud R et al*.[41]stated that cutting diathermy resulted in reduced post-operative wound related discomfort.

In our study, there was significant difference in distribution of mean score between Scalpel and Diathermy groups. Wherein, the diathermy outperformed the scalpel on the basis of separation of deep tissue, pus culture obtained, erythema, discharge and post operative pain.

Guru A.K. et al.[45]reported that Wound healing and scar score were better in the diathermy group than in the scalpel group.*AbdElaala N.K. et al*.[44] found that there was a substantial difference between the two groups in terms of postoperative discomfort, with the diathermy group having fewer of these characteristics.

In the present study due to the inclusion criteria all abdominal surgeries were included, along with emergencies such a perforated gallbladder, liver abscesses & intestines (small & large). Leading to contaminated surgeries affecting the over all wound healing of the scalpel or the diathermy incision.

Few studies have looked into the utility of electrocautery during transverse incision surgery, however several have compared it to using a scalpel for midline incisions.[54] Although the latter may have an impact on healing and wound problems, *Mageed A.A. et al*.[48] found that investigation did not discover any appreciable variations in postoperative wound complications or healing. This was in linewith the other studies as well.[55,56]*Agarwal D et al*.[46]stated that Seroma development was identified in 12 and 16, wound dehiscence in 3 and 8, and bleeding/haematoma in 1 and 7 in groups I and II, respectively.

M. R. Pattnaik et al.[24]found that complications occurred in 18 percent of diathermy (group A) patients and 21 percent of scalpel (group B) patients. 82 percent of diathermy (group A) patients had good scars, 17 percent had fair scars, and 1.5 percent had bad scars. In the scalpel group (group B), 79% had great scars, 18% had fair scars, and 3% had bad scars.

Okereke C.E. et al.[42]reported that among the scalpel incision group, there was one wound infection and none in the diathermy incision group. *Mahmud R et al*.[41]stated that cutting diathermy resulted in no changes in wound complication rate or scar aesthetic results. Wahab P.U. et al.[38] discovered that the rates of postoperative wound healing problems were 68.1 percent in group A and 77 percent in group B. *Abdelaal N et al*.[37] using diathermy in skin incision during abdominal surgical procedures resulted in no increase in postoperative discomfort or wound problems when cutting diathermy was used for abdominal skin incisions.

Theoretically, the prophylactic use of antibiotics might reduce wound infection rates but not bacterial colonization. Numerous research addressed the problems and healing of wounds. *Cruse and Foord*.[40] were the first to notice a strong correlation between wound infections and diathermy use, which they ascribed to a considerable amount of necrotic charred tissue still present in the wound. Later, *Cruse and Foord*[40] accepted that the infection rate in women following surgery was the same whether diathermy was utilized or not with less damaging tissue. The majority of following investigations discovered no statistically significant difference in wound infection between knife surgery and cutting diathermy.[57-59]*Amin et al*.[60] noted that more frequently, wound healing issues were linked to diathermy incision wounds. In comparison to knife usage, diathermy incisions had indurated margins, a higher incidence of wound infection, and a more durable incision site, according to Soballeet al.[61]

According to *Kearns et al*.,[1] there was no discernible difference between the two groups' postoperative wound complication rates in this investigation. Electrocautery was deemed to be as safe as a scalpel in terms of wound healing with a decrease in the need for postoperative analgesics by Chrysoset al.[62] after they discovered no difference in wound complication rates or postoperative pain with its usage. According to *Stolz*

et al.,[63] elective surgery scalpel and electrosurgical thoracotomy incisions had comparable early and late wound problems. In patients undergoing gynaec&oncosurgery, *Franchiet al.*[64] discovered that the scalpel group had a greater incidence of serious wound complications than the electrocautery group (8/531 vs. 1/433).

Groot and Chappell.[65] found wound infections in 38 of 250 scalpel patients (15%) and in 30 of 242 cautery patients (12%); age grouping, use of steroids, incidence of diabetes, number of days prior to surgery, length of surgery, use of drains, number of obese patients, or gender ratio were not different from those in this study. When *Dixon*.[66] compared electrosurgical incision to scalpel incision of the skin, the latter procedure consistently produced better aesthetic outcomes with fewer problems. The patients accept the method well and experience no additional discomfort. Only after a scalpel incision were wound hematomas and skin diathermy burns visible. In a study of 49 mastectomies, *Miller et al*.[67] discovered that cautery patients experienced much less surgical blood loss than scalpel patients.

In present study, there was significant difference in distribution of Post-operative Pain between Scalpel and Diathermy groups. Scalpel showed more post operative pain due to the factors discussed above namely erythema, separation of deep tissues and discharge as compared to scalpel. *Mukherjee MP et al*.[47]discovered that post-operative pain levels were assessed daily for five days and revealed no statistically significant difference between the two groups. *Okereke C.E. et al*.[42]reported that the mean pain score in the diathermy incised wounds was greater, although this was not statistically significant.*Furqan M et al*.[36]stated that the mean pain score in the diathermy group was 4.10±0.71, whereas it was 6.86±0.62 in the scalpel group.

Mageed A.A. et al.[48]found that when compared to scalpel incisions, incisions created with cutting diathermy demonstrated a substantial difference in the first postoperative day VAS pain score. This conclusion is in line with the findings of two meta-analyses.[52]It was found that the diathermy group experienced much less postoperative discomfort. *Okereke C.E. et al*.[42]reported that the mean pain score in the diathermy incised wounds was greater, although this was not statistically significant.

Some researches came to the conclusion that diathermy exhibited decreased postoperative pain by completely or partially injuring the cutaneous nerves in the surgical skin incision.[62] However, we think that localized sensory neuron loss caused by diathermy ablation may impair nerve impulse transmission. Pure sinusoidal current produces instantaneous nerve necrosis and cell vaporization without significantly impacting the adjacent tissues.

The electrosurgical incision results in molecular disintegration along the electrode's route rather than severing tissue. The surgeon who does electrosurgery must be fully qualified, well-versed in electrosurgical procedures, and aware of how the local wound environment affects healing.[68] To avoid cutaneous burns while employing electrosurgical incisions, care must be given to ensure that the patient is properly grounded using a dispersive electrode. The tissue should be swiftly sliced with the lowest electrode and power setting feasible.[69]

Additionally, excluding the scalpel from the operating area is a desirable alternative given the recent rise in bloodborne illnesses such hepatitis C and HIV infection.[9] Injuries to the scalpel blade have been linked to the transmission of hepatitis C, TB, and the human immunodeficiency virus to surgeons.[70-73]

SUMMARY

&

CONCLUSION

SUMMARY & CONCLUSION

The study findings can be summarised as follows :

- Mean Age between Scalpel (41.69±16.70) and Diathermy (41.46±17.20) groups.
- There were 56.0% males and 44.0% females in the study
- Difference in mean blood haemoglobin between Scalpel (11.96%±1.23%) and Diathermy (11.97%±1.23%) groups. Normal Haemoglobin range varies from 9gm% - 15gm%.
- Mean TLC between Scalpel (8410.00±3956.98) and Diathermy (8535.00±4023.98) groups. The normal TLC ranges varies from 4000/cumm – 11000/cumm.
- The mean Gauze Soaked among Scalpel and Diathermy groups was 6.54±6.63 and 2.13±1.70 respectively.
- The mean Duration of stay in hospital among Scalpel and Diathermy groups was 3.05±2.00 and 1.01±.01 respectively
- The distribution of Separation of Deep Tissue was compared between Scalpel and Diathermy, Burst Abdomen was reported among 2 (2.0%) each
- There was no significant difference in distribution of Pus C & S between Scalpel and Diathermy groups. Sterile sample were reported among 6 % in scalpel & 2% in diathermy.
- The distribution of POD of Suture Removal was compared between Scalpel and Diathermy . 80% of the sutures were removed in group A on the 7^{th} day & 82 % of the sutures were removed in group B on the 7^{th} day
- There was a significant difference in distribution of Inference between Scalpel and Diathermy groups. There was Good prognosis among 78.0%, Poor wound healing among 13.0% and Severely infected wound among 9.0% in Scalpel group. There was Good prognosis among 93.0%, Poor wound healing among 3.0% and Severely infected wound among 4.0% in Scalpel group.

- There was significant difference in distribution of Erythema between Scalpel and Diathermy groups. There was score 0 among 96.0%, score 1 among 3.0%, score 2 among 1.0%, score 3 score 4 and score 5 among 0.0% subject among Scalpel group. There was score 0 among 92.0%, score 1 among 1.0%, score 2 among 3.0%, score 3 among 2.0%, score 4 among 2.0% and score 5 among 0.0% subjects among Diathermy group.
- On the basis of discharge there was score 0 among 93.0%, score 1 among 2.0%, score 2 among 3.0%, score 3 among 2.0%, score 4 among 0.0% and score 5 among 0.0% subjects among Scalpel group. There was score 0 among 95.0%, score 1 among 4.0%, score 2 among 1.0%, score 3 among 0.0%, score 4 among 0.0% and score 5 among 0.0% subjects among Diathermy group.
- There was a significant difference in distribution of Post-operative Pain between Scalpel and Diathermy groups. There was score 0 among 44.0%, score 1 among 21.0%, score 2 among 18.0%, score 3 among 7.0%, score 4 among 5.0% and score 5 among 5.0% subjects among Diathermy group. There was score 0 among 65.0%, score 1 among 16.0%, score 2 among 12.0%, score 3 among 4.0%, score 4 among 3.0% and score 5 among 0.0% subjects among Scalpel group.
- The mean Post-operative Pain among Scalpel and Diathermy groups was 4.38±1.82 and 2.33±1.82 respectively. The mean Post-operative Pain was significantly more among Scalpel group compared to Diathermy group.

CONCLUSION:

In comparison to using scalpel, diathermy is an efficient way to lessen post-operative discomfort. Regarding the likelihood of post-operative wound infection, diathermy is just as safe as a scalpel. The post-operative scar is identical to the one left by a knife in incision made with diathermy.

BIBLIOGRAPHY

1. Kearns SR, Connolly EM, McNally S, McNamara DA, Deasy J. Randomized clinical trial of diathermy versus scalpel incision in elective midline laparotomy. Br J Surg2001; 88: 41–4.
2. Ali M, Murtaza M, Aleem-ud-Din M, Burhan ud Din M, Sarwar A, Aslam A, et al. Comparison of harmonic scalpel versus conventional hemostasis in thyroid surgery in terms of per-operative and postoperative outcome. Prof Med J. 2020;27(1):68–73.
3. Pattnaik M, Prasad K, Dey M, Ashish Vadhera. Comparison of the Outcome of Diathermy Versus Scalpel Skin Incision in Surgical Cases. Indian j surg. 2019; 81(2):32–6.
4. Mukherjee MP, Patole M. Scalpel versus diathermy skin incision: a randomised clinical trial. Int Surg J . 2020;7(1):258–62.
5. Mithun G, Bharathidasan R, Maheshwari N. A randomized comparative study of diathermy incisions and scalpel incisions in subacute appendicitis. IAIM.2019;6(7):59-66.
6. Lodhi F, Asrar R, Akram M Hussain R. Incidence of abdominal wound dehiscence (midline vs paramedian incision closed with vicryl no. 1). King Edward med Coll.2001;7(1):38-40
7. Kumar V, Tewari M, Shukla S. A comparative study of scalpel and surgical diathermy incision in elective operations of head and neck cancer. Indian J Cancer.2011;48(2)216-9.
8. Vadodariya B, Shah N, Petal M. Comparative randomized controlled clinical trial of diathermy versus scalpel incision in midline laparotomy. Int Surg J. 2018;6(1):28-32.
9. Gupta M, Soni S, Saini P. A prospective study of scalpel skin incision versus diathermy in patients undergoing inguinal hernioplasty. Orig Res Artic J Evol Med Dent Sci. 2017;6(3):136-8.
10. Pearlman NW, Stiegmann GV, Vance V, Norton LW, Bell RCW, et al. A prospective study of incisional time, blood loss, pain, and healing with carbon dioxide laser, scalpel, and electrosurgery. Archives of surgery.1991; 126(8): 1018-1020.

11. Prgomet D, Janjanin Sa, BiliÄ‡ M, PrstaÄiÄ‡ R, KovaÄ L, et al. (2009) A prospective observational study of 363 cases operated with three different harmonic scalpels. European archives of oto-rhino-laryngology 266(12): 1965.

12. Structure And Function Of The Skin | Wound Care Education". CliniMed. Archived from the original on 2019-01-31. Retrieved 2019-01-31

13. Proksch E, Brandner JM, Jensen JM (2008). "The skin: an indispensable barrier". Exp Dermatol. **17** (12): 1063–1072. doi:10.1111/j.1600-0625.2008.00786.x. PMID 19043850. S2CID 31353914

14. Nasoori, Alireza (August 2020). "Formation, structure, and function of extra-skeletal bones in mammals". BiologicalReviews. **95** (4):9861019. doi:10.1111/brv.12597. PMID 32338826. S2CID 216556342.

15. Rhees, David J. "Electricity - "The greatest of all doctors": An introduction to "High Frequency Oscillators for Electro-therapeutic and Other Purposes"". Proceedings of the IEEE. Inst. of Electrical and Electronic Engineers.1999; **87** (7): 1277–1281. doi:10.1109/jproc.1999.771078.

16. Ho, Mae-Wan; Popp, Fritz Albert; Warnke, Ulrich (1994). Bioelectrodynamics and Biocommunication. World Scientific. 1994:10–11. ISBN 978-9810216658.

17. J. W. Hand, "Biophysics and Technology of Electromagnetic Hyperthermia" in Gautherie, Michel, Ed. Methods of External Hyperthermic Heating. Springer Science & Business Media. 2012: 4–8. ISBN 978-3642746338.

18. Scalpel versus electrosurgery for major abdominal incisions 2017 june 14 Monitoring Editor: Kittipat Charoenkwan, Zipporah Iheozor-Ejiofor, Kittipan Rerkasem, Elizabeth Matovinovic, and Cochrane Wounds Group Faculty of Medicine, Chiang Mai University, Department of Obstetrics and Gynecology, 110 Intawaroros Road, Chiang Mai Thailand, 50200

19. Diathermy versus scalpel incisions in elective abdominal surgery: a comparative study Vikranth S.Nandurkar, MohanKumarK.,PrakashM.,SumaS.IsjjournAL2018VOL5 NO9

20. Comparision of the outcome of diathermy versus scalpel skin incision in surgical cases m.r.Pattna ik. K.g. Prasad. 2017 novindian journal of surgery

21. Johnson CD, Serpell JW. Wound infection after abdominal incision with scalpel or diathermy. Br J Surg1990;77:626-74.

22. Dixon AR, Watkin DF. Electrosurgical skin incision versus conventional scalpel: A prospective trial. J R CollSurgEdinb1990;35:299-301.

23. TalpurA, Khaskheli A, Kella N, Jamal A. Randomized,clinical trial on diathermy and scalpel incisions in elective general surgery. Red Crescent Med.2015;17(2):e14078.

24. Pattnaik M, Prasad K, Dey M, Ashish Vadhera. Comparison of the Outcome of Diathermy Versus Scalpel Skin Incision in Surgical Cases. Indian j surg. 2019; 81(2):32–6.

25. Shamim M. Diathermy vs. scalpel skin incisions in general surgery: double-blind, randomized, clinical trial. World J Surg. 2009;33(8):1594-9. doi: 10.1007/s00268-009-0064-9.

26. Kumar V, Tewari M, Shukla H S. A comparative study of scalpel and surgical diathermy incision in elective operations of head and neck cancer. Indian J Cancer 2011;48:216-9

27. Kadyan B, Chavan S, Mann M, Punia P, Tekade S. A prospective study comparing diathermy and steel scalpel in abdominal incisions. Med J DY Patil Univ 2014;7:558-63.

28. Ayandipo O.O., Afuwape O.O., Irabor D., Oluwatosin O.M., Odigie V. Diathermy versus scalpel incision in a heterogeneous cohort of general surgery patients in a Nigerian teaching hospital. Niger J Surg 2015;21:43-7.

29. Kalawar R.P.S., Khanal G.P., Chaudhary P., Rijal R., Maharjan R., Paneru S.R., et al. Comparative study of safety and efficacy of electrocautery blade with cold scalpel blade for skin opening during fixation of fracture of forearm bone with plate and screws. Comparative study of safety Health Renaissance 2015;13(2): 43-49

30. Talpur A.A., Khaskheli A.B., Jamal A. **Randomized, Clinical Trial on Diathermy and Scalpel Incisions in Elective General Surgery.** Iranian Red Crescent Medical Journal.2015. Corpus ID: 1475878. DOI:10.5812/ircmj.14078

31. Chhabda T. S. , Agrawal Mohit A., Prospective Randomized Control Trial Comparing Diathermy versus Scalpel for Skin Incisions in Patients Undergoing Elective Surgeries. International Journal of Science and Research (IJSR).2015;12(4).

32. Ansari M.A. , Mishra S.M. , Baskota B.D. A Comparative Study of Electrocautery Versus Cold Scalpel For Skin Incision In Inguinal Hernia Repair. JNGMC.2016;14(1):14-17.

33. Priya N, Lamture YR, Luthra L. A comparative study of scalpel versus surgical diathermy skin incisions in clean and clean-contaminated effective abdominal surgeries in AVBRH, Wardha, Maharashtra, India. J Datta Meghe Inst Med Sci Univ 2017;12:21-5

34. Ragesh KV, Mahendran S, Mathad S. Outcome of skin incision by cautery versus steel scalpel in hernia surgery: a prospective cohort study at a tertiary medical college hospital in South India. Int Surg J 2017;4:1521-4.

35. Margarita P., Andrijana G., Gjorgje D., Vladimir G., Hristina B., Roza D.T. Electrosurgical micro needle versus scalpel skin incisions in the facial region. Anamed. 2018; 13(3): 269–273.

36. Furqan M, Syeda B B, Muhammad J A, Syed I H, Syed I A. Pain Scores of Scalpel versus Diathermy Skin Incisions in Head and Neck Surgeries. Glob J Oto, 2018; 16(3): 555936. DOI: 10.19080/GJO.2018.16.555936

37. Abdelaal N, Allakwa H, Alhalaby A, Hamdy A. Diathermy versus Scalpel in Abdominal Skin Incisions: Systematic Review. Perceptions Reprod Med. 1(3). PRM.000517. 2018. DOI: 10.31031/PRM.2018.01.000517

38. Wahab P.U., Madhulaxmi M., Senthilnathan P., Muthusekhar M.R., Vohra Y., Abhinav R.P., Scalpel Versus Diathermy in Wound Healing After Mucosal Incisions: A Split-Mouth Study. dentoalveolar surgery.2018;76(6):1160-1164**.**

39. Pandey S. , Choubey R.P., narain I.T. Diathermy Versus Conventional Scalpel in Making an Abdominal Incision: A Prospective Study. Journal of Clinical and Diagnostic Research. 2019, Vol-13(10): PC09-PC11.

40. Cruse PJ, Foord R. The epidemiology of wound infection: A 10-year prospective study of 62 939 wounds. Surg Clin North Am 1980;60(1):27-40.

41. Mahmud R. , Faisal F.H. , Mahmud F. , Miah M., Reza M.N. , Hoque K.R., et al. Clinical Outcome of Surgical Diathermy in Elective Surgery. KYAMC Journal.2019;10(3).

42. Okereke C.E., Katung A.I., Adesunkanmi A.K., Alatise O.I. Surgical outcome of cutting diathermy versus scalpel skin incisions in uncomplicated appendectomy: A comparative study. Niger Postgrad Med J 2019;26:100-5

43. Kaban A, Küçükyurt A, Durmuş A, Kaban I, Verit FF. Comparison of Cutting Diathermy and Scalpel in Terms of Delay in Wound Healing and Scar Appearance in Skin Incision: A Prospective Observational Study. İstanbul Med J 2019; 20(4): 338-41.

44. AbdElaala N.K. , Ellakwaa H.E. , Elhalabya A.F. , Shaheena A.E. , Aishb A.H. et al. Scalpel versus diathermy skin incisions in cesarean sections. Journal of Obstetrics and Gynaecology. (2019); 32(2):453-457.

45. Guru A.K., Sathiah V. A comparative study on diathermy vs scalpel skin incisions in abdominal surgeries at a tertiary care teaching hospital. International Journal of Contemporary Medicine Surgery and Radiology. 2020;5(4):D17-D21

46. Agarwal D, Srivastava K, Tandon H. Comparison of the outcome of diathermy incisions v/s surgical scalpel incisions in general surgery. J Adv Med Dent Scie Res 2020;8(12):179-182.

47. Mukherjee MP, Patole MM. Scalpel versus diathermy skin incision: a randomised clinical trial. Int Surg J 2020;7:258-62.

48. Mageed AA, Fotoh E, Fouad R, Gamal N, Salama EN, Abdel-Rasheed M, et al. Diathermy v. scalpel Pfannenstiel incision in repeated caesarean sections: A randomised controlled trial. S Afr J Obstet Gynaecol 2021;27(1):4-7.

49. Aird LN, Brown CJ. Systematic review and meta-analysis of electrocautery versus scalpel for surgical skin incisions. Am J Surg 2012;204(2):216-221.

50. Sheikh B (2004) Safety and efficacy of electrocautery scalpel utilization for skin opening in neurosurgery. Br J Neurosurg 18:268–272.

51. Ly J, Mittal A, Windsor J. Systematic review and meta-analysis of cutting diathermy versus scalpel for skin incision. Br J Surg. 2012;99:613-20.

52. Prakash LD, Balaji N, Kumar SS, et al. Comparison of electrocautery incision with scalpel incision in midline abdominal surgery – a double blind randomised controlled trial. Int J Surg 2015;19:78-82. https://doi.org/10.1016/j.ijsu.2015.04.085

53. Nandurkar VS, Prakash M, Suma S. Diathermy versus scalpel incisions in elective abdominal surgery: A comparative study. Int Surg J 2018;5(9):3124-3128.

54. Club DHRJ. Randomised clinical trial of diathermy versus scalpel incision in elective midline laparotomy. Br J Surg 2001;88(1):1129.

55. Bostanci EI, Guler I, Akdulum FC, et al. Electrocautery versus scalpel in women undergoing primary cesarean section and neonatal outcomes. Gynecol Obstet Reprod Med 2020;26(3):184-187. https://doi.org/10.21613/GORM.2019.921

56. Mukherjee MP, Patole MM. Scalpel versus diathermy skin incision: A randomised clinical trial. Int Surg J 2019;7(1):258-262.

57. 18. Kearns S, Gilmore M, McCabe J, et al. Diathermy versus scalpel incisions for hemiarthroplasty: A randomised prospective trial. Bone Joint J 2004;86:129.

58. 19. Eren T, Balik E, Ziyade S, et al. Do different abdominal incision techniques play a role in wound complications in patients operated on for gastrointestinal malignancies? Scalpel vs. electrocautery. Acta Chir Belg 2010;110(4):451-456.

59. 20. Ahmad NZ, Ahmed A. Meta-analysis of the effectiveness of surgical scalpel or diathermy in making abdominal skin incisions. Ann Surg 2011;253(1):8-13.

60. Amin M, Nadeem K, Aziz I. Randomised comparative study of electrosurgical and conventional scalpel incisions in general surgery. Surgery 2010;20(25):15-22.

61. Soballe PW, Nimbkar NV, Hayward I, et al. Electric cautery lowers the contamination threshold for infection of laparotomies. Am J Surg 1998;175(4):263-266.

62. Chrysos E, Athanasakis E, Antonakakis S, Xynos E, Zoras O. A prospective study comparing diathermy and scalpel incisions in tension-free inguinal hernioplasty. Am Surg. 2005 Apr;71(4):326-9.

63. Stolz AJ, Schutzner J, Lischke R, Simonek J, Pafko P (2004) Is a scalpel required to perform a thoracotomy? Rozhl Chir 83:185–188

64. Franchi M, Ghezzi F, Benedetti-Panici PL, Melpignano M, Fallo L, Tateo S, Maggi R, Scambia G, Mangili G, Buttarelli M (2001) A multicentre collaborative study on the use of cold scalpel and electrocautery for midline abdominal incision. Am J Surg 181:128–132.

65. Groot G, Chappell EW (1994) Electrocautery used to create incisions does not increase wound infection rates. Am J Surg. 167:601–603

66. Dixon AR, Watkin DF. Electrosurgical skin incision versus conventional scalpel: a prospective trial. J R Coll Surg Edinb. 1990 Oct;35(5):299-301.

67. Miller E, Paull DE, Morrissey K, Cortese A, Nowak E. Scalpel versus electrocautery in modified radical mastectomy. Am Surg. 1988 May;54(5):284-6.

68. Peterson A (1982) The use of electrosurgery in reconstructive and cosmetic maxillofacial surgery. Dent Clin North Am 26:799–823

69. Sebben JE. Electrosurgery principles: cutting current and cutaneous surgery--Part I. J Dermatol Surg Oncol. 1988 Jan;14(1):29-31.

70. Kaspar TA, Wagner RF Jr (1991) Percutaneous injury during dermatologic surgery. J Am Acad Dermatol 24:756–759

71. Ippolito G, Italiano-Rischio O (1996) Scalpel injury and HIV infection in a surgeon. Lancet 347(9007):1042

72. Tapias L, Tapias-Vargas LF, Tapias-Vargas L (2008) Primary cutaneous inoculation tuberculosis in a healthcare worker as a result of a surgical accident. Int J Dermatol 47:833–835

73. Tsude K, Fujiyama S, Sato S, Kawano S, Taura Y, Yoshida K, Sato T (1992) Two cases of accidental transmission of hepatitis C to medical staff. Hepato gastroenterology 39:73–75

PROFORMA

NAME: I.P. NO:

AGE: UNIT:

SEX: D.O.A:

OCCUPATION: D.O.D:

ADDRESS: D.O.SURGERY:

CLINICAL DIAGNOSIS:

INVESTIGATIONS

1. BLOOD: HB%:

2.TLC:

3. VIRAL MARKERS:

FINAL DIAGNOSIS:

NAME OF SURGERY:

INCISION VIA: DIATHERMY OR SCALPEL

INSCISIONTIME:

NO OF GAUZE SOAKED:

WOUND ASSESSMENT

ASEPSIS SCORING

ERYTHEMA

DISCHARGE

SEPARATION OF DEEP TISSUE

DURATION OF STAY IN HOSPITAL:

PUS C& S

POST OP PAIN

TOTALSCORE:

POD OF SUTURE REMOVAL

SKIN BIOPSY

INFERENCE

SANTOSH MEDICAL COLLEGE AND HOSPITAL (GHAZIABAD)

INFORMED CONSENT

I_____Son/Daughter/Wife of_____resident of _____hereby declare that I give my full, free and voluntary informed consent in the thesis "**Comparison of the outcome of Diathermy Vs Scalpel Skin Incision in Surgical Cases**". Dr._____has informed me to my full satisfaction, in the language I understand, about the purpose, nature of study and various laboratory investigations for the study to be carried out. I have been informed about the duration of the study and instructions to be followed during the study period.

I give full consent for being enrolled in the above study and I reserve my rights to withdraw fromthis study, whenever I wish without prejudice of my right to undergo further treatment at SantoshHospital, Ghaziabad U.P.

Patient's/ Patient's relative's signature

Doctor's signature or
Thumb impression

Name:

Date:

We have witnessed that the patient signed the above form in the presence of his free will after fully understanding its content.

Signature of Witness

Name

Signature of investigator

Dr. Nida Khan

PG. Department of General Surgery.

Contact No.-9004667686

संतोषमेडिकलकॉलेजएवंअस्पताल (गाजियाबाद)
सहमतिपत्र (सूचित)

मैं _____ बेटा / बेटी /पत्नी_____
निवासी _____ घोषणाकरताहूंकिमैं

डॉ._____, नेमुझेमेरीभाषामेंअपनेअध्ययन**Comparison of the outcome of diathermy Vs scalpel skin incision in surgical cases**अध्ययनकेउद्देश्यकेबारेमें,औरअध्ययनकेदौरानअपनाईजानेवालीविभिन्नप्रयोगशालाजांचकेबारेमेंसूचितकरदिया है।मुझेअध्ययनकीअवधिऔरउसकेदौरानअपनाएजानेवालेनिर्देशभीमेरीभाषामेसमझादिएगएहैं|मैंउपरोक्तअध्ययनमें बिनाकिसीदबावकेदाखिलालेरहाहूंऔरपूर्णसहमतिदेरहाहूं|सन्तोषअस्पताल, गाजियाबादमेंअपनेआगेकेउपचारपरबिनाप्रतिकूलप्रभावडालेइसअध्ययनसेऔरप्रयोगशालाजांचकीप्रकृतिसेमैंजबचाहूँ बाहरजानेकेअपनेअधिकारकोसुरक्षितरखरहाहूं |

रोगी / रोगीकेरिश्तेदारकेहस्ताक्षर डॉक्टरकेहस्ताक्षर
नाम
दिनांक:
मेरीउपस्थितिमेंमरीजनेपूरीतरहसेडाकटरकेबताएगएअध्ययनऔरनिर्देशोंकोसमझनेकेबादअपनीस्वतंत्रइच्छासेऊपर केफार्मपरहस्ताक्षरकिएहैं।

हस्ताक्षर

नाम: डॉनिदा खान
पदनाम: पीजी
शल्यचिकित्साविभाग
संपर्कनंबर- 9004667686

BIOSTATISTIC CERTIFICATE

TO WHOM SO EVER IT MAY CONCERN

CERTIFICATE

This is to certify that the results of the research work titled **"COMPARISON OF THE OUTCOME OF DIATHERMY v/s SCALPEL SKIN INCISION IN SURGICAL CASES"** carried out by **Dr. Nida Khan** from Department of Surgery, Santosh Medical College & Hospital, Ghaziabad, U.P. was analyzed statistically using software SPSS version 25.0 (IBM SPSS Statistics, IBM corp., 2018).

The necessary statistical tests were applied as per the requirement of the thesis and to the best of my knowledge.

Dr. Sukhvinder Singh Oberoi
BDS, MDS, Cert. Biostatistics
Professor and Head
Department of Public Health Dentistry
GIDSR, Ferozpur

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

F. No. SU/2021/1830[46] Dated: 17.07.2021

Subject: Grant of Ethical Clearance for Thesis Protocol Topic **"COMPARISON OF THE OUTCOME OF DIATHERMY VS SCALPEL SKIN INCISION IN SURGICAL CASES",** submitted by **Dr. Nida Nadim Khan,** MD/MS student of Batch 2020-2021, Department of **General Surgery**.

*****

With reference to his/her request for grant of Ethical Clearance for the Thesis Protocol entitled **"COMPARISON OF THE OUTCOME OF DIATHERMY VS SCALPEL SKIN INCISION IN SURGICAL CASES", Dr. Nida Nadim Khan** is informed that the Thesis Protocol submitted by him/her was considered by the **Screening Committee** of the Santosh Medical College & Hospital in its meetings held on 19.03.2021, 22.03.2021, 24.03.2021, 25.03.2021, 26.03.2021, 27.03.2021 and 06.04.2021. The recommendations of the **Screening Committee** were considered in detail by the Institutional **Ethics Committee** in its meeting held on **12.07.2021** and the same was **approved** by the **Ethics Committee**.

He /She is informed accordingly for further necessary action.

[Dr. V. P. Gupta]
REGISTRAR

SANTOSH DEEMED TO BE UNIVERSITY REGISTRAR GHAZIABAD, NCR DELHI

Dr. Nida Nadim Khan
MD/MS student of batch 2020-2021
Department of General Surgery
Email: khannidanadimdoc@gmail.com

Copy to:

1. The Vice Chancellor
2. The Dean, SMC&H
3. The Dean – Research
4. The Dean – Academics
5. The Director - IQAC
6. Dr. Shalabh Gupta (Guide)
7. HOD of **General Surgery**

PLAGIARISM CERTIFICATE

Ouriginal

Document Information

Analyzed document	0 - Combined final.docx (D149441705)
Submitted	11/12/2022 5:35:00 AM
Submitted by	Dr Jyoti Batra
Submitter email	drjyotibatra89@gmail.com
Similarity	9%
Analysis address	drjyotibatra89.sug@analysis.urkund.com

Sources included in the report

W	URL: https://www.ijsr.net/archive/v4i12/NOV152299.pdf Fetched: 10/10/2020 7:17:53 AM	4
W	URL: http://repository-tnmgrmu.ac.in/11449/1/220100319arun_guru.pdf Fetched: 12/12/2020 1:05:37 PM	11
W	URL: https://www.ijcmsr.com/uploads/1/0/2/7/102704056/ijcmsr_496.pdf Fetched: 8/23/2021 11:55:12 PM	3
W	URL: https://link.springer.com/article/10.1007/s12262-017-1707-y Fetched: 10/3/2019 9:16:15 AM	3
W	URL: https://www.researchgate.net/publication/24404287_Diathermy_vs_Scalpel_Skin_Incisions_in_Gener... Fetched: 10/3/2019 9:16:41 AM	7
W	URL: https://www.researchgate.net/publication/12193296_Randomized_clinical_trial_of_diathermy_versu... Fetched: 10/3/2019 9:16:50 AM	3
W	URL: https://www.indianjcancer.com/article.asp?issn=0019-509X;year=2011;volume=48;issue=2;spage=216... Fetched: 7/12/2022 5:41:58 AM	1
W	URL: https://www.researchgate.net/publication/338192793_Scalpel_versus_diathermy_skin_incision_a_ra... Fetched: 11/9/2020 5:38:50 AM	3
W	URL: https://www.nepjol.info/index.php/JNGMC/article/view/17487 Fetched: 10/28/2019 2:24:54 AM	1
W	URL: https://pubmed.ncbi.nlm.nih.gov/31187749/ Fetched: 8/23/2021 11:55:10 PM	1
W	URL: https://www.mmj.eg.net/article.asp?issn=1110-2098;year=2019;volume=32;issue=2;spage=453;epage=... Fetched: 12/20/2021 7:36:07 AM	2
W	URL: https://www.researchgate.net/publication/336648494_To_Compare_Cosmetic_Outcome_using_Cutting_D... Fetched: 7/29/2020 10:12:18 AM	2
W	URL: http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2305-88622022000100002 Fetched: 11/5/2022 11:41:54 AM	5

MASTERCHART

	DIATHERMY OR SCA	NAME	AGE	SEX	PROCEDURE	DIAGNOSIS	Blood	TLC	VIRAL MAR	GAUZE SOA	ERTHRI	DISCHAI	POST OP PA	SEPARATION OF DEE	DURATION OF STAY IN I	PUS C&S	TOTAL SCOR	POD OF SUTURE REM	SKIN BIOP	INFERENCE
1	SCALPEL	GANGA SARAH	81	MALE	EXPLORATORY LAPAROTOMY GA	LIVER ABSCESS WITH SEPTICEMIA	12c	24631	NR	12	0	0	2	0 5 DAYS	N/A		14	N/A		GOOD PROGNOSIS
2	SCALPEL	BEGARAY	63	MALE	JABOULAY'S PROCEDURE	LEFT SIDED HYDROCELE	13c	5990	NR	4	0	0	1	0 3 DAYS	N/A		4	N/A		GOOD PROGNOSIS
3	SCALPEL	SUHAN	13	MALE	CRANIOTOMY	HAEMOPHEDH	15c	12964	NR	15	4	4	0	2 5 DAYS	N/A	N/A		N/A		POOR WOUND HEALING
4	SCALPEL	KADIR	12	MALE	OPEN APPENDECTOMY	ACUTE APPENDICITIS	11c	4475	NR	5	0	0	2	0 3 DAYS	N/A	N/A		N/A		GOOD PROGNOSIS
5	SCALPEL	PARVEEN	23	MALE	DEBRIDEMENT & SUTURING	RTA	16c	1600	NR	20	0	1	2	0 5 DAYS	N/A	N/A		N/A		GOOD PROGNOSIS
6	SCALPEL	BEENA DEVI	39	FEMALE	EXCISION OF SWELLING	CYSTIC SWELLING IN THIGH	12c	14200	NR	12	4	4	1	1 2 DAYS	STERILE		12		14	POOR WOUND HEALING
7	SCALPEL	RANJANA	42	FEMALE	LAP CHOLE	CHOLELITHIASIS	11c	4520	NR	4	1	0	1	0 2 DAYS	STERILE		4		14	GOOD PROGNOSIS
8	SCALPEL	SUNITA	35	FEMALE	EXPLORATORY LAPAROTOMY GA	PERFORATION PERITONITIS	11c	2000	NR	24	4	3	3	3 5 DAYS	STERILE		10		20	POOR WOUND HEALING
9	SCALPEL	AMIT	23	MALE	LAP CHOLE	CHOLELITHIASIS	12c	3000	NR	1	0	0	2	0 4 DAYS	STERILE		2		14	GOOD PROGNOSIS
10	SCALPEL	ASHOK	60	MALE	LAP CHOLE	CHOLELITHIASIS	16c	2320	NR	2	0	0	2	0 4 DAYS	STERILE		2		14	GOOD PROGNOSIS
11	SCALPEL	SAMEERA	55	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	4000	NR	3	0	0	2	0 4 DAYS	N/A		2		14	GOOD PROGNOSIS
12	SCALPEL	SANJAY	24	MALE	LAP CHOLE	CHOLECYSTITIS + HUCOCOELE	14c	4200	NR	3	0	0	2	0 4 DAYS	N/A		2		14	GOOD PROGNOSIS
13	SCALPEL	JYOTI	24	FEMALE	LAP CHOLE	CHOLELITHIASIS	11c	4000	NR	2	0	0	2	0 4 DAYS	N/A		2		14	GOOD PROGNOSIS
14	SCALPEL	SUNITA	32	FEMALE	LAP CHOLE	CHOLLITHIASIS	12c	1000	NR	0	0	0	2	0 4 DAYS	N/A		2		14	GOOD PROGNOSIS
15	SCALPEL	RAKESH	59	MALE	FISTULECTOMY	FISTULA IN ANO	12c	1000	NR	7	2	2	4	0 4 DAYS	N/A		3	N/A		GOOD PROGNOSIS
16	SCALPEL	JYOTI	24	FEMALE	LAP CHOLE	CHOLELITHIASIS	16c	1000	NR	2	0	0	2	0 4 DAYS	N/A		2	N/A		GOOD PROGNOSIS
17	SCALPEL	DAYARAM	72	MALE	MIPH	GRADE 3 HAEMORRHOIDS	12c	4000	NR	4	0	0	0	0 1DAY	N/A		1	N/A		GOOD PROGNOSIS
18	SCALPEL	MUMTAZ ALI	58	MALE	APPENDICECTOMY	ACUTE APPENDICITIS	14c	1100	NR	10	1	0	2	0 4 DAYS	N/A		2		14	GOOD PROGNOSIS
19	SCALPEL	SANTOSH	45	FEMALE	EXICISION OF SWELLING	SCALP LIPOMA	11c	4000	NR	15	3	3	0	2 0 DAYS	N/A		10		14	GOOD PROGNOSIS
20	SCALPEL	PALLAVI	18	FEMALE	I & D	TRAUMATIC COLLECTION IN RT THIGH	11c	12,000	NR	18	3	3	3	2 0 DAYS	N/A		10		14	GOOD PROGNOSIS
21	SCALPEL	BABY OF RAZIA	1 DAY	MALE	JEJUNAL ATRESIA SECONDARY TO INTRAUTERINE VOLVULUS	EXPLORATORY LAPAROTOMY	9c	24000	NR	20	2	2	2	0 5 DAYS	N/A		4	N/A		GOOD PROGNOSIS
22	SCALPEL	GORAKH	65	MALE	LAP CHOLE	ACUTE CALCULUS CHOLECYSTITIS + INCISIONAL HERNIA	12c	4000	NR	1	0	0	2	0 4 DAYS	N/A		14		12	GOOD PROGNOSIS
23	SCALPEL	NIRMALADEVI	55	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	4000	NR	1	0	0	2	0 4 DAYS	N/A		2		14	GOOD PROGNOSIS
24	SCALPEL	SODAN	60	MALE	JABOULAY'S PROCEDURE	L SIDED HYDROCOELE	12c	1000	NR	4	2	1	2	0 4 DAYS	N/A		5		14	GOOD PROGNOSIS
25	SCALPEL	ALKA	30	FEMALE	LAP CHOLE	CHOLELITHIASIS	11c	7000	NR	2	0	0	2	0 4 DAYS	N/A		2		14	GOOD PROGNOSIS
26	SCALPEL	SANA	23	FEMALE	EXICISION	FIBROADENOMA RT BREAST	15c	7000	NR	10	2	0	2	0 4 DAYS	N/A		4		14	GOOD PROGNOSIS
27	SCALPEL	SAPNA	45	FEMALE	LAP CHOLE	CHOLELITHIASIS	11c	3000	NR	10	2	0	2	0 4 DAYS	N/A		19		14	DISTURBANCE
28	SCALPEL	DAYARAM	52	MALE	EXPLORATORY LAPAROTOMY GA	RTA WITH SPLENIC HEMATOMA	16c	15000	NR	30	4	0	5	0 5 DAYS	N/A		19		14	GOOD PROGNOSIS
29	SCALPEL	ARVIND	42	MALE	CIRCUMCISION UNDER LA	BALANAOPOSTHITIS	12c	1000	NR	10	2	0	2	0 4 DAYS	N/A		2		14	GOOD PROGNOSIS
30	SCALPEL	RAJENDER	40	MALE	FISTULECTOMY	FISTULA IN ANO	12c	1000	NR	7	2	2	5	0 4 DAYS	N/A	N/A		N/A		GOOD PROGNOSIS
31	SCALPEL	JAIPRAKASH	55	MALE	PENILE DEBULKING + SPC	CA PENIS	12c	12000	NR	20	5	2	5	1 0 DAYS	N/A	N/A		10	N/A	DISTURBANCE
32	SCALPEL	JAMUNA	35	MALE	APPENDICECTOMY	ACUTE APPENDICITIS	12c	12000	NR	3	2	0	5	0 4 DAYS	N/A	N/A		7	N/A	GOOD PROGNOSIS
33	SCALPEL	RAJENDRA	72	MALE	LEFT INGUINAL HERNIOPLASTY	LEFT INDIRECT COMPLETE INGUINAL HERNIA	11c	7000	NR	5	2	0	5	0 0	N/A	5	17		14	DISTURBANCE
34	SCALPEL	SONI	30	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	3000	NR	5	0	2	0	0 N/A		0	2		14	GOOD PROGNOSIS
35	SCALPEL	SUNITA	42	FEMALE	HESHNERNIOPLASTY	INFRAUMBELICAL HERNIA	12c	5000	NR	5	2	1	0	0 N/A		0	3		14	GOOD PROGNOSIS
36	SCALPEL	JANVATI	54	FEMALE	LAP CHOLE	CHOLELITHIASIS	11c	4000	NR	2	0	0	5	0 N/A		0	5		14	GOOD PROGNOSIS
37	SCALPEL	HARNAND TYAG	79	MALE	LEFT INGUINAL HERNIOPLASTY	LEFT INGUINAL HERNIA	12c	1000	NR	5	0	0	5	0 N/A		0	5		14	GOOD PROGNOSIS
38	SCALPEL	KORAM	50	MALE	CIRCUMCISION UNDER LA	PHIMOSIS	15c	12000	NR	5	2	0	5	0 N/A		0	7		14	GOOD PROGNOSIS
39	SCALPEL	SUNDHAYA	24	FEMALE	I&D	GLUTEAL CRBUNCLE LEFT HIP	12c	1000	NR	2	5	0	5	0 N/A		10	N/A		N/A	GOOD PROGNOSIS
40	SCALPEL	DEVARAM	60	MALE	JABOULAY'S PROCEDURE	HYDROCOELE RIGHT	12c	1000	NR	2	2	0	5	0 N/A		0	7		14	GOOD PROGNOSIS
41	SCALPEL	DHARAMKUMA	29	MALE	HASTECTOMY	GRADE 3 B/L GYENACOMASTIA	13c	1000	NR	5	2	0	5	0 N/A		0	12		14	GOOD PROGNOSIS
42	SCALPEL	SADDAM	16	MALE	EXPLORATORY LAPAROTOMY GA	PERFORATION PERITONITIS	16c	12000	NR	5	5	5	5	BURST ABDOMEN		0	N/A		25	NHA	SEVERELY INFECTED WOUND
43	SCALPEL	OMPRAKASH	32	MALE	FISTULECTOMY	FISTULA IN ANO	12c	12000	NR	4	2	2	5	0		0	N/A		10	N/A	SEVERELY INFECTED WOUND
44	SCALPEL	VEDCHAND	40	MALE	JABOULAY'S PROCEDURE	RT HYDROCOELE	12c	1500	NR	6	2	2	5	0		0	N/A		9	14	NHA	GOOD PROGNOSIS
45	SCALPEL	HIRJI HARITA	45	FEMALE	EXPLORATORY LAPAROTOMY + PERITONEAL LAVAGE + MODIFIED GRAHAM PA	CHOLECYSTODUODENAL FISTULA + BILIOMA POST LAP C	11c	14500	NR	20	5	5	5	BURST ABDOMEN		0	N/A		25	NHA	SEVERELY INFECTED WOUND
46	SCALPEL	MRS RENU	33	FEMALE	FIBROADENOMA R/B BREAST	EXICISION OF FIBROADENOMA	12c	1500	NR	6	2	0	2	0		0	N/A		6	14	NHA	GOOD PROGNOSIS
47	SCALPEL	LAYAK RAM	70	MALE	CHOLELITHIASIS + CHOLEDHOCOLITHIASIS	OPEN CHOLECYSTECTOMY + CHOLEDOCOSTOMY	12c	1000	NR	12	2	0	2	0		0	N/A		4	14	NHA	GOOD PROGNOSIS
48	SCALPEL	MUNNI DEVI	33	FEMALE	CHOLELITHIASIS	LAP CHOLE	12c	1000	NR	2	0	0	2	0		0	N/A		2	14	NHA	GOOD PROGNOSIS
49	SCALPEL	ARIF KHAN	45	MALE	CHOLELITHIASIS	LAP CHOLE	12c	1000	NR	2	0	0	2	0		0	N/A		2	14	NHA	GOOD PROGNOSIS
50	SCALPEL	JAMEELA	45	FEMALE	UMBELLICAL HERNIA	HERNIOPLASTY	12c	1000	NR	1	0	0	2	0		0	N/A		4	14	NHA	GOOD PROGNOSIS
51	SCALPEL	VIHLA NARAYAN	50	FEMALE	CARBUNCLE	I&D	12c	4000	NR	0	2	0	2	0		0	N/A		4	14	NHA	GOOD PROGNOSIS
52	SCALPEL	BADRI	79	MALE	INCISIONAL HERNIA	HERNIOPLASTY	12c	1000	NR	2	0	0	2	0		0	N/A		2	NHA	NHA	GOOD PROGNOSIS
53	SCALPEL	AARIF	40	MALE	CHOLELITHIASIS	LAP CHOLE	12c	9000	NR	4	0	0	0	0		0	2	NHA	NHA	GOOD PROGNOSIS
54	SCALPEL	DHONDU	30	MALE	LEFT VARICOCOELE	VARICOCELECTOMY	13c	3000	NR	2	3	0	0	0		0	3	NHA	NHA	GOOD PROGNOSIS
55	SCALPEL	PANWAR LAL	72	MALE	LAP CHOLE	CHOLELITHIASIS	12c	9000	NR	0	0	0	2	0		0	N/A		2	7	NHA	GOOD PROGNOSIS
56	SCALPEL	ANITA	45	FEMALE	LAP CHOLE	CHOLELITHIASIS	14c	9000	NR	0	1	0	0	0		0	N/A		1	7	NHA	GOOD PROGNOSIS
57	SCALPEL	GULAFSHA	42	FEMALE	LAP CHOLE	CHOLELITHIASIS	16c	8500	NR	0	1	0	2	0		0	N/A		2	7	NHA	GOOD PROGNOSIS
58	SCALPEL	SHUSHRUT	18	MALE	ACUTE APPENDICITIS	DIAGNOSTIC LAP F/B OPEN APPENDECTOMY	11c	14500	NR	19	2	2	5	2		0	N/A		13	14	NHA	GOOD PROGNOSIS
59	SCALPEL	MRS ASHA	35	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	4000	NR	2	0	0	2	0		0	N/A		2	7	NHA	GOOD PROGNOSIS
60	SCALPEL	MRS BABITA	35	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	5000	NR	0	2	0	0	0		0	N/A		2	7	NHA	GOOD PROGNOSIS
61	SCALPEL	MANISHA	20	FEMALE	EXICISION OF BREAST LUMP	RT BREAST FIBROADENOMA	12c	7000	NR	0	0	0	3	0		0	N/A		2	7	NHA	GOOD PROGNOSIS
62	SCALPEL	DEEPAK KUMAR	29	MALE	DJ STENT REMOVAL	NEPHROLITHIASIS	12c	7000	NR	0	0	0	3	0		0	N/A		0	N/A	NHA	GOOD PROGNOSIS
63	SCALPEL	ARIFA	45	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	5000	NR	0	2	0	0	0		0	2	N/A	0	7	NHA	GOOD PROGNOSIS
64	SCALPEL	RAJ KUMARI	55	FEMALE	MRH LEFT BREAST	LEFT BREAST CARCINOMA	12c	20	2	2	2	4	0	0		0	N/A		4	7	NHA	GOOD PROGNOSIS
65	SCALPEL	MRS RAJESHWARI	30	MALE	APPENDICECTOMY	ACUTE APPENDICITIS	12c	12000	NR	5	2	2	4	0		0	N/A		2	7	NHA	GOOD PROGNOSIS
66	SCALPEL	BABITA	30	FEMALE	EXICISION UNDER LA	INFECTED SEBACEOUS CYST	12c	9000	NR	2	2	2	0	0		0	STERILE	4	7	NHA	GOOD PROGNOSIS
67	SCALPEL	MEENA	30	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	9000	NR	0	0	2	0	0		0	N/A	4	7	NHA	GOOD PROGNOSIS
68	SCALPEL	BABLI	47	FEMALE	URETHRAL DIALATATION	URETHRAL STRICTURE	16c	9000	NR	5	2	0	0	2		0	N/A	4	7	NHA	GOOD PROGNOSIS
69	SCALPEL	SASHI	32	FEMALE	LAP CHOLE + CHOLEDOCOTOMY	CHOLELITHIASIS + CBD STONE	15c	9000	NR	0	2	2	2	2		0	N/A	4	7	NHA	GOOD PROGNOSIS
70	SCALPEL	PD JOSHI	20	MALE	HERNIOPLASTY	RT INGUINAL HERNIA	12c	9500	NR	0	2	0	0	2		0	N/A	4	7	NHA	GOOD PROGNOSIS
71	SCALPEL	SAGAR	18	MALE	DELAYED RESUTURING	ILEOCAECAL TB + PERFORATION	13c	6000	NR	1	0	2	0	2		0	N/A	4	7	NHA	GOOD PROGNOSIS
72	SCALPEL	HARESH	47	MALE	URETHRAL DIALATATION	URETHRAL STRICTURE	15c	9000	NR	1	0	0	2	2		0	N/A	5	7	NHA	GOOD PROGNOSIS
73	SCALPEL	IQRA	55	FEMALE	RT MRM	RT BREAST CA	11c	4500	NR	20	2	0	2	0		0	N/A	8	12	NHA	GOOD PROGNOSIS
74	SCALPEL	MUSTAKEEN	45	MALE	ELEVATION OF RT PARIETAL DEPRESSED BONE	LT PARIETAL DEPRESSED BONE + SAH AND CONTUSION	16c	8500	NR	14	2	2	2	2		0	N/A	8	12	NHA	GOOD PROGNOSIS
75	SCALPEL	DILIP	28	MALE	EXPLORATORY LAPARTOMY	PERFORATION PERITONITIS	11c	4500	NR	25	2	2	2	2		0	12	N/A	0	15	NHA	GOOD PROGNOSIS
76	SCALPEL	SHISHPAL	71	MALE	JABOULAY'S PROCEDURE	HYDROCOELE RIGHT	12c	3000	NR	5	2	0	5	0		0	N/A	7	14	NHA	GOOD PROGNOSIS
77	SCALPEL	RAJENDER	29	MALE	MASTECTOMY	GRADE 3 B/L GYENACOMASTIA	13c	3000	NR	5	2	5	5	0		0	N/A	12	14	NHA	GOOD PROGNOSIS
78	SCALPEL	EHSAN	16	MALE	EXPLORATORY LAPAROTOMY GA	PERFORATION PERITONITIS	16c	12000	NR	5	5	5	5	BURST ABDOMEN		0	N/A	25	NHA	NHA	SEVERELY INFECTED WOUND
79	SCALPEL	OM CHAND	32	MALE	FISTULECTOMY	FISTULA IN ANO	12c	13000	NR	4	2	2	5	0		0	N/A	9	NHA	NHA	GOOD PROGNOSIS
80	SCALPEL	VED PRAKASH	40	MALE	JABOULAY'S PROCEDURE	RT HYDROCOELE	12c	8500	NR	6	2	2	5	0		0	N/A	9	14	NHA	GOOD PROGNOSIS
81	SCALPEL	REENU	45	FEMALE	EXPLORATORY LAPAROTOMY + PERITONEAL LAVAGE + MODIFIED GRAHAM PA	CHOLECYSTODUODENAL FISTULA + BILIOMA POST LAP C	11c	14500	NR	20	5	5	5	BURST ABDOMEN		0	N/A	25	7	NHA	SEVERELY INFECTED WOUND
82	SCALPEL	SHEETAL	33	FEMALE	FIBROADENOMA R/B BREAST	EXICISION OF FIBROADENOMA	12c	8500	NR	6	2	0	2	0		0	N/A	6	14	NHA	GOOD PROGNOSIS
83	SCALPEL	MR SINGH	70	MALE	CHOLELITHIASIS + CHOLEDHOCOLITHIASIS	OPEN CHOLECYSTECTOMY + CHOLEDOCOSTOMY	12c	3000	NR	12	2	0	2	0		0	N/A	4	14	NHA	GOOD PROGNOSIS
84	SCALPEL	RASHEE	33	FEMALE	CHOLELITHIASIS	LAP CHOLE	12c	3000	NR	2	0	0	2	0		0	N/A	2	14	NHA	GOOD PROGNOSIS
85	SCALPEL	ALTAF	48	MALE	CHOLELITHIASIS	LAP CHOLE	13c	10000	NR	2	0	0	2	0		0	N/A	2	14	NHA	GOOD PROGNOSIS
86	SCALPEL	JASLEEN	45	FEMALE	UMBELLICAL HERNIA	HERNIOPLASTY	12c	9500	NR	1	2	0	2	0		0	N/A	4	14	NHA	GOOD PROGNOSIS
87	SCALPEL	VIHLAANI	50	FEMALE	CARBUNCLE	I&D	12c	4000	NR	0	2	0	2	0		0	N/A	4	14	NHA	GOOD PROGNOSIS
88	SCALPEL	SARUKH	79	MALE	INCISIONAL HERNIA	HERNIOPLASTY	12c	8500	NR	0	2	0	0	0		0	N/A	2	NHA	NHA	GOOD PROGNOSIS
89	SCALPEL	HUSHTAQ	40	MALE	CHOLELITHIASIS	LAP CHOLE	12c	9000	NR	4	0	0	0	0		0	2	NHA	NHA	NHA	GOOD PROGNOSIS
90	SCALPEL	SONU	30	MALE	LEFT VARICOCOELE	VARICOCELECTOMY	13c	2000	NR	2	3	0	0	0		0	N/A	3	NHA	NHA	GOOD PROGNOSIS
91	SCALPEL	DAKSHIT	73	MALE	LAP CHOLE	CHOLELITHIASIS	12c	9000	NR	0	0	0	2	0		0	N/A	2	7	NHA	GOOD PROGNOSIS
92	SCALPEL	RANJANA	45	FEMALE	LAP CHOLE	CHOLELITHIASIS	16c	9000	NR	0	1	0	0	0		0	N/A	1	7	NHA	GOOD PROGNOSIS
93	SCALPEL	GULNAAZBANO	42	FEMALE	LAP CHOLE	CHOLELITHIASIS	16c	8500	NR	0	1	0	2	0		0	N/A	2	7	NHA	GOOD PROGNOSIS
94	SCALPEL	SHISHIR	18	MALE	ACUTE APPENDICITIS	DIAGNOSTIC LAP F/B OPEN APPENDECTOMY	14c	8500	NR	19	2	2	5	2		0	N/A	13	14	NHA	DISTURBANCE
95	SCALPEL	AASHNA	30	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	4000	NR	2	0	0	2	0		0	N/A	2	7	NHA	GOOD PROGNOSIS
96	SCALPEL	PURTI DEVI	35	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	3000	NR	0	2	0	0	0		0	N/A	2	7	NHA	GOOD PROGNOSIS
97	SCALPEL	MADHU	20	FEMALE	EXICISION OF BREAST LUMP	RT BREAST FIBROADENOMA	12c	5000	NR	5	0	0	2	0		0	N/A	2	7	NHA	GOOD PROGNOSIS
98	SCALPEL	RAJDEEP	29	MALE	DJ STENT REMOVAL	NEPHROLITHIASIS	12c	7000	NR	0	0	0	3	0		0	N/A	0	N/A	NHA	GOOD PROGNOSIS
99	SCALPEL	PIYUSH	18	MALE	CIRCUMCISION UNDER LA	MEATAL STENOSIS	13c	7000	NR	4	2	2	2	2		0	N/A	8	7	NHA	GOOD PROGNOSIS

	DIATHERMY OR S	NAME	AGE	SEX	PROCEDURE	DIAGNOSIS	Blood	TLC	VIRAL	GAUZE SOAK	ERTH	DISCH	POST	SEPAI	DURA	PUS C	TOTAL	POD C	SKIN E	INFERENCE
2	DIATHERMY	Baby pathak	30	FEMALE	EXPLORATORY LAPARATOMY GA	chronic chalolithiasis	11c	24631	NR	12	0	0	2	0	5 DAYS	N/A		14	N/A	GOOD PROGNOSIS
3	DIATHERMY	suman	13	MALE	craniotomy	massive edh	13c	5990	NR	4	0	0	1	0	3 DAYS	N/A		4	N/A	GOOD PROGNOSIS
4	DIATHERMY	KADIR	12	MALE	APPENDICECTOMY	appendicitis	12c	12964	NR	15	4	4	0	2	5 DAYS	N/A	N/A		N/A	POOR WOUND HEALING
5	DIATHERMY	ravi	97	MALE	LAP CHOLE	cholelithiasis	11c	4475	NR	5	0	0	2	0	3 DAYS	N/A	N/A		N/A	GOOD PROGNOSIS
6	DIATHERMY	niyaz ahmed	54	MALE	debridement under SA	necrotizing fasciitis (L) foot + impending gangrene + T2DM + septicaemia	16c	1600	NR	20	0	1	2	0	5 DAYS	N/A	N/A		N/A	GOOD PROGNOSIS
7	DIATHERMY	ankush sharma	33	MALE	B/L direct inguinal hernia + B/L varicocele	B/L mesh hernioplasty + Bazini's repair duo-tahernia	12c	14200	NR	12	4	4	1	1	2 DAYS	STERILE	12		14	POOR WOUND HEALING
8	DIATHERMY	jitesh	42	FEMALE	left hand cellulitis	I&D under brachial block	11c	4520	NR	4	1	0	1	0	2 DAYS	STERILE	4		14	GOOD PROGNOSIS
9	DIATHERMY	durkyant	22	male	EXPLORATORY LAPARATOMY GA	Blake rupture diverticulum abscess	11c	2000	NR	24	4	3	3	3	5 DAYS	STERILE	10		20	POOR WOUND HEALING
10	DIATHERMY	Sapna	27	FEMALE	necrotizing fasciitis + severe sepsis + bronchopneumonia	excision and debridement	12c	2000	NR	1	0	0	2	0	3 DAYS	STERILE	2		14	N/A
11	DIATHERMY	shivakumar	42	MALE	abscess + cellulitis of rt foot	I&D debridement	16c	2320	NR	2	0	0	2	0	4 DAYS	STERILE	2		14	N/A
12	DIATHERMY	ASHA	76	FEMALE	MRM LEFT BREAST	CA LEFT BREAST	12c	4000	NR	4	0	0	2	0	4 DAYS	N/A	2		14	N/A
13	DIATHERMY	RIZWABH	23	MALE	LAP CHOLE	CHOLECYSTITIS + HUCOCOELE	14c	4200	NR	2	0	0	2	0	4 DAYS	N/A	2		14	N/A
14	DIATHERMY	NASIR ALI	48	MALE	EXPLORATORY LAPARATOMY GA	PERFORATION PERITONITIS	11c	17000	NR	12	0	0	2	0	4 DAYS	N/A	2		14	N/A
15	DIATHERMY	SUNITA	32	FEMALE	LAP CHOLE	CHOLLITHIASIS	12c	3000	NR	17000	0	0	2	0	4 DAYS	N/A	2		14	N/A
16	DIATHERMY	RAJWATI	48	FEMALE	LAP CHOLE	CHOLELITHIASIS	11c	4000	NR	7	2	2	4	0	4 DAYS	N/A	0	N/A		GOOD PROGNOSIS
17	DIATHERMY	JYOTI	24	FEMALE	LAP CHOLE	CHOLELITHIASIS	16c	9000	NR	2	0	0	2	0	4 DAYS	N/A	2	N/A		GOOD PROGNOSIS
18	DIATHERMY	DAYARAM	72	MALE	MIPH	GRADE 3 HAEMORRHOIDS	12c	4000	NR	4	0	0	0	0	1DAY	N/A	1	N/A		GOOD PROGNOSIS
19	DIATHERMY	MUNTAZ ALI	58	MALE	APPENDICECTOMY	ACUTE APPENDICITIS	14c	1100	NR	10	1	0	2	0	4 DAYS	N/A	3	14	N/A	GOOD PROGNOSIS
20	DIATHERMY	SANTOSH	45	FEMALE	EXICISION OF SWELLING	SCALP LIPOMA	11c	4000	NR	15	2	2	0	0	4 DAYS	N/A	4	14	N/A	GOOD PROGNOSIS
21	DIATHERMY	PALLAVI	18	FEMALE	I & D	TRAUMATIC COLLECTION IN RT THIGH	11c	12,000	NR	18	3	3	3	2	0 DAYS	N/A	10	14	N/A	GOOD PROGNOSIS
22	DIATHERMY	BABY OF RAZIA	1	MALE	JEJUNAL ATRESIA SECONDARY TO INTRAUTERINE VOLVULUS	EXPLORATORY LAPAROTOMY	9c	24000	NR	20	2	2	2	0	5 DAYS	N/A	4	N/A		GOOD PROGNOSIS
23	DIATHERMY	GORAKH	65	MALE	LAP CHOLE	ACUTE CALCULUS CHOLECYSTITIS + INCISIONAL HERNIA	12c	9000	NR	1	0	0	2	0	4 DAYS	N/A	14	12	N/A	GOOD PROGNOSIS
24	DIATHERMY	NIRMALA DEVI	55	FEMALE	LAP CHOLE	CHOLELITHIASIS	12c	3000	NR	1	0	0	2	0	4 DAYS	N/A	2	14	N/A	GOOD PROGNOSIS
25	DIATHERMY	SODAN	60	MALE	JABOULAY'S PROCEDURE	L SIDED HYDROCOELE	12c	3000	NR	4	2	1	2	0	4 DAYS	N/A	5	14	N/A	GOOD PROGNOSIS
26	DIATHERMY	ALKA	30	FEMALE	LAP CHOLE	CHOLELITHIASIS	11c	7000	NR	2	0	0	2	0	4 DAYS	N/A	2	14	N/A	GOOD PROGNOSIS
27	DIATHERMY	SANA	23	FEMALE	EXICISION	FIBROADENOMA RT BREAST	15c	7000	NR	10	2	0	2	0	4 DAYS	N/A	4	14	N/A	GOOD PROGNOSIS
28	DIATHERMY	SAPNA	45	FEMALE	LAP CHOLE	CHOLELITHIASIS	11c	3000	NR	10	2	0	2	0	4 DAYS	N/A	19	14	N/A	DISTURBANCE
29	DIATHERMY	DAYARAM	52	MALE	EXPLORATORY LAPARATOMY GA	RTA WITH SPLENIC HEMATOMA	16c	15000	NR	30	4	0	5	0	5 DAYS